1653. Vol. XLV

JUNE 29th. 194

FLIGHT

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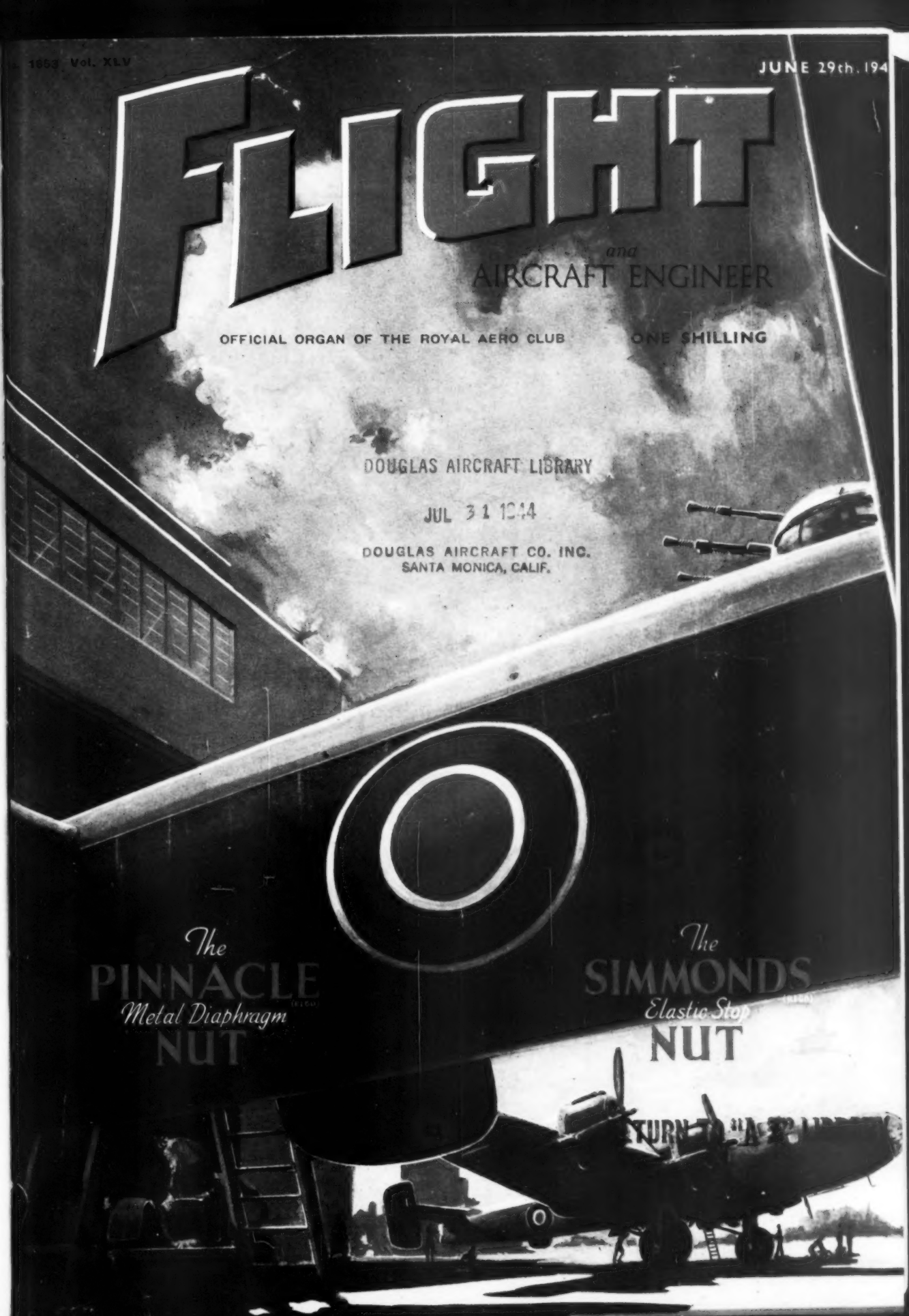

The
PINNACLE
Metal Diaphragm
NUT

The
SIMMONDS
Elastic Stop
NUT

Flight, June 29th, 1944. *Advt.*

THE SLEEVE VALVE EXPLAINED . . . . No. 5

BREATHING CHARACTERISTICS

Sleeve valves are directly responsible for the excellent breathing characteristics of "Bristol" engines; such characteristics not only improve economy but definitely minimise wear and enhance the working life of the engine.

For example, the oscillating motion of the sleeves as they move up and down their cylinder bores prevents localised lubrication; oil is rolled evenly over the entire bearing surface between sleeve and cylinder. At the same time, cool oil from the crankshaft jets is directed to the under side of the piston and down the sleeve bore.

The reciprocating and twisting motion of the sleeves dissipates heat over a larger area thus reducing cylinder temperature. This minimises wear and at the same time ensures freedom from hot lead corrosion.

Couple these advantages with the fact that, as the pistons and sleeves on "Bristol" engines move in the same direction at different speeds, there is a considerable reduction in piston rubbing speed with consequent reduction in piston wear. This, of course, is another advantage of

"Bristol"

SLEEVE VALVE AERO ENGINES

FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

D.R.G.M.

NOW that more details have become known, it is possible to form a clearer opinion of the technical features of the air torpedo. The outstanding discovery is that the jet unit is of the compressorless type, which means that it is very inefficient, although one must admit that it is effective. There is, of course, a certain degree of "ram" effect due to the forward speed of the machine (one of the first uses of this was made in the Rolls-Royce "R" engines of the Schneider Supermarines), but this is not likely to be comparable in efficiency with a compressor.

That the efficiency is low will be realised by comparing the air torpedo with one of the heavy bombers. Its fuel tank carries 130 gallons of petrol. As the range may be assumed somewhere in the neighbourhood of 150 miles, the consumption works out at a little more than a mile per gallon. A heavy four-engined bomber, at its top speed, does just about as well, although at a lower speed. There is, of course, no comparison between the bomb loads carried by the two types, while for bombing accuracy the air torpedo is nowhere in the picture.

Interesting is also the fact that the jet unit does not work on the continuous combustion principle but intermittently, which accounts for the exhaust sounding something like that of a multi-cylinder piston engine. It seems obvious that the whole basis of the design has been simplicity and ease of manufacture, so that the enemy could afford to waste large numbers.

In connection with the gyroscopic control of the machine, it appears likely that this is a development of an automatic pilot produced some ten years ago by the Siemens firm of Berlin. Known as the "Autopilot," that instrument differed from other automatic pilots in that its gyroscopes were not the sole basis of the corrections applied by the working cylinders to the flight-control surfaces. For instance, the elevator control received its initial impulse from the pitot tube. Similarly, the rudder control was worked from a tele-compass, and it appears, from the official drawing, that there is evidence of such an instrument being mounted in the nose. Aileron control was initiated by a pendulum, but in the air torpedo this third control seems to have been dispensed with. In the original Siemens "Autopilot" the medium used in the working cylinders was oil. In the air torpedo it is air, doubtless for lightness and simplicity.

Should our surmise be correct, and the rudder is actually operated by a compass, the deflection of the air torpedoes from their course should not be difficult!

A Pitiful Expedient

ONE would have to search diligently through the records of warfare to find a more telling case of substituting futility and propaganda for true military measures than the recent German employment of the air torpedo. Hitler has always loved to talk about "secret weapons" in the hopes of making British flesh creep, and likewise of cheering the spirits of his own people.

There was a time when he seemed likely to make good his words. The magnetic mine, to which he said that no antidote was possible, did for a time give us British a real fright. Shipping, as everybody knows, is our most tender point. To strike at our shipping was a real threat to our chances of winning the war. The heroism of the men who dissected one of the mines, and the brilliance of British scientists, soon removed that threat; but we had certainly had a fright.

Compared with the surmounted danger of the mag-

netic mine, how pitiful seems the expedient of the air torpedo! Of course, tragedies have occurred, and those who have suffered are not likely to consider the matter trivial—but neither did the merchant seamen and their relatives think lightly of the magnetic mine. From the strategic point of view, that is to say when one thinks about winning the war, the magnetic mine was (for a short time) important, while the air torpedo is of no importance at all. Apart from the chance (and it is purely a remote chance) of one destroying an important building or killing an important individual, the worst it can do is to distract some of the time and attention which our fighters and medium bombers might have spent on harrying the German forces in Normandy. For the rest, it merely enabled the German propaganda machine for a time to tell fairy stories about panic-stricken crowds choking the roads out of London, and perhaps distracting German civilian attention from the obvious signs of certain defeat which are now pressing on them from all sides. But even that relief was short-lived, and the Germans had to "put the brake" on their ridiculous claims.

Another Naval Air Fight

A SINGLE sea fight of the Trafalgar class ought to settle Japan's strategic position, and leave only tactical mopping up to be done. When Admiral Nimitz reported last week that the elusive Japanese battle fleet had emerged into the open and was apparently offering battle somewhere off the Philippines, expectations ran high that the great moment had come.

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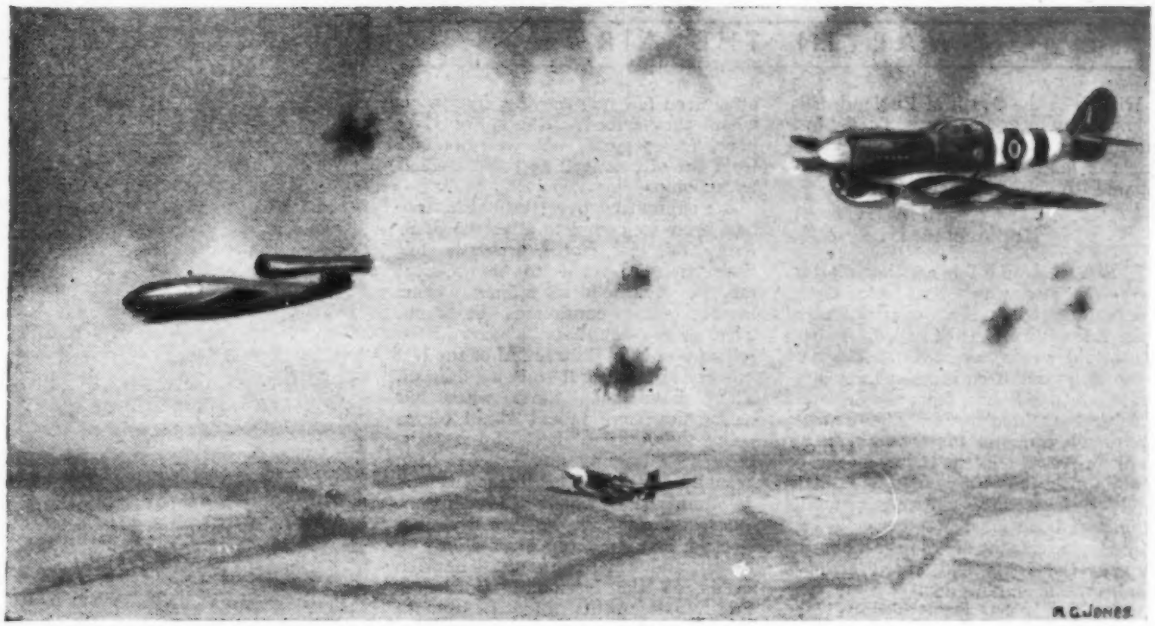
Such hopes were disappointed. The fight resolved itself once more into a combat between the aircraft carriers of both sides. The capital ships, it appears, never engaged each other with their guns; and so a decisive action did not eventuate. The enemy lost heavily both in ships and aircraft, and then fled in the darkness. The Americans won great honour; but the enemy's battle fleet remains in being, though foiled and scarred.

We British learnt off the shores of Malaya that a large air contingent when unopposed can sink capital ships; but when the aircraft are approximately equal in strength, it is the big guns of the battleships which score a decisive victory. The Allies have yet to win such a victory over the Japanese. But if the Japanese will not fight, victory will go by default.

TOKIO TROUNCER: The new Boeing B 29 bears a distinct family likeness to its Fortress brother. For operation at great heights the cabin is pressurised until an air fight begins. Oxygen masks are then put on and the cabin de-pressurised.

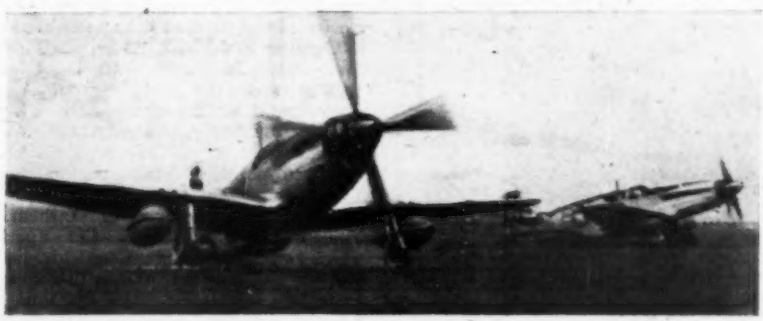


A pencil sketch by R. G. Jones of an actual incident where a Typhoon and Mustang flew through our own A.A. bursts to shoot down a flying bomb.

WAR in the AIR

Dealing with the Flying Bomb : U.S. Shuttle Service to Russia : American Carriers Hit the Japanese Fleet

THE Hawker Tempest fighter made its bow to the public at a moment which gave it the opportunity to earn laurels without delay. It will be remembered that the Hawker Typhoon was still "our latest" fighter at the time when the Germans were conducting daily hit-and-run raids on the towns of the South Coast of England with fighter-bombers. The Typhoons were the machines which played the chief part in tackling these raids, and they took so heavy a toll of the low-flying raiders that the Germans soon abandoned that method of nuisance raiding. Now, just when the enemy has launched his flying bombs, the Tempests come into the limelight. One Group of Tempests has had great success in shooting down a high proportion of these nasty pests. The speed of the Tempest is a great asset in this kind of operation, and the robots cannot take evasive action when the British fighters get on their tracks and open fire. Likewise the robots cannot shoot back at the British pilots. The only danger to our men seems to be that the explosion of the one-ton bomb might damage the pursuing fighter. Our fighter pilots had to work out new tactics for dealing with this novel sort of quarry, but it is reported that they found before long that it was possible to fly up to within 100 yards of the thing before opening fire. This was an advantage, as the target is small. It is, however, very vulnerable, for hitting the explosive charge is not the only way of destroying the thing. The automatic pilot inside will not stand up to the hail of lead from the guns of a fighter, and if it is hit, the career of "the destruction that wasteth at noonday" is brought to a speedy close. The same thing happens if the jet mechanism is hit, and, of course, damage to wings is as effective as in the case of a normal aircraft.



HIGH-STEPPING MUSTANG : Mustang escort fighters operating with the U.S.A.A.F. Fortresses which landed in Russia after shuttle-bombing Germany. Note the long-range tanks under the wings.

Some other facts about the flying bomb are worth emphasising. When a normal German bomber is shot down, the enemy's resources are reduced by that much. If it had not been shot down it would have lived to fight another day. The flying bomb, on the other hand, can never repeat its performance. Once it has been despatched the Germans know that they will never see it again. So their supply problem is not affected by whether it kills some

WAR IN THE AIR

civilians in the South of England or is shot down into the sea. They have accumulated just so many specimens at the launching bases and are prepared to expend them all.

Replacement

REPLACEMENT is another matter. Whether any more are being manufactured in the workshops after the intensive efforts of Allied bombers in recent weeks, we have no means of knowing; but if so it must be a difficult job to get them from the factories to the launching bases. They cannot be flown up, and must be taken by rail or road. Both these means of communication have been considerably dislocated by the recent bombing, and both must now be congested by the movement of troops and stores up to the battlefield in Normandy. Substantial replacements after the initial supply has been expended are hardly to be expected. Apart from any device which our scientists may discover, the final cure for the pest is the capture of the bases by the Allied armies. A beginning has been made in that direction, and it is to be hoped that the remaining bases will fall into our hands before long.

It is surprising how little response the *Luftwaffe* has made to the invasion of Normandy. It has made only sporadic appearances, doubtless being overawed by the terrific concentration of Allied fighters over the area. At the same time some of the strategic bomber raids by the Allies have met with comparatively little opposition in the air, although the *flak* has been heavy. Consequently, Allied bombers have been left more or less free to go where they willed. Cherbourg Harbour, for instance, was well bombed from the air, as well as being shelled by warships.

Air supremacy over the battle area has been so complete that the U.S. Army 8th Air Force presently felt itself free to turn to non-tactical targets. Synthetic oil refineries came in for some continuous attention. That was doubtless a considered follow-up of the destruction of the last refinery of natural oil at Ploesti. There have been times when our authorities have talked about oil as being the Achilles' heel of the Axis, but the Germans have never been actually short of oil. Transport and communications would still seem to be more important targets, for it cannot be said that even the great efforts of British and American aircraft have so sealed off the Normandy battlefield that reinforcements cannot be brought up to aid Rommel in his stand.

Bombers to the Rescue

WHAT was of obvious help to Gen. Eisenhower was the bombing of Boulogne and Havre. The former place received a lot of attention before "D" day, and it was subsequently made known that it was an intermediate base for E-boats and R-boats. From there they would push on to their advanced base at Havre, hoping that from such close quarters they could do substantial damage to the invasion shipping. It was for this reason that quite soon after the landings on the beaches Bomber Command departed from its usual practice and sent out Lancasters and Halifaxes by day to bomb first Havre and then Boulogne. At Havre 12,000-lb. bombs were dropped in the harbour so as to send a most damaging tidal wave up into the pens. The boats moored in the harbour all disappeared, and must have been sunk. That was a case in which Bomber Command, despite its preoccupation with the assault on production, gave most valuable tactical help to the Navy and Army. It may also be mentioned that Coastal Command has helped to bomb Cherbourg Harbour. Thus the promise made long ago by the Air Staff that when the invasion began the whole of the Air Force would come to the aid of the other two Services has been made good.

FULL STEAM AHEAD! A German merchantman in the Aegean Sea after an attack by rocket-firing Beaufighters.

TAIL URGE: Fitting the electric firing leads to a heap of rocket projectiles on a Typhoon airfield.

Ground and Air

ANOTHER incident from the early days of the invasion seems to have received less attention than it deserved. A German force had hidden itself so completely in some woods that Typhoons of the 2nd Tactical Air Force could see no signs of it. The artillery, however, knew where the Germans were, and they fired smoke shells to point out the spot to the Typhoons. The latter had rockets, and promptly came down to use them. The incident illustrates the apex which co-operation between ground and air has reached, and is therefore extremely interesting. All the same, it seems a reversal of the natural order of things. It is more usual for aircraft to tell the ground troops where the enemy are; also, if the enemy are

WAR IN THE AIR

within range of the guns, it is almost heterodox to use aircraft to hit them.

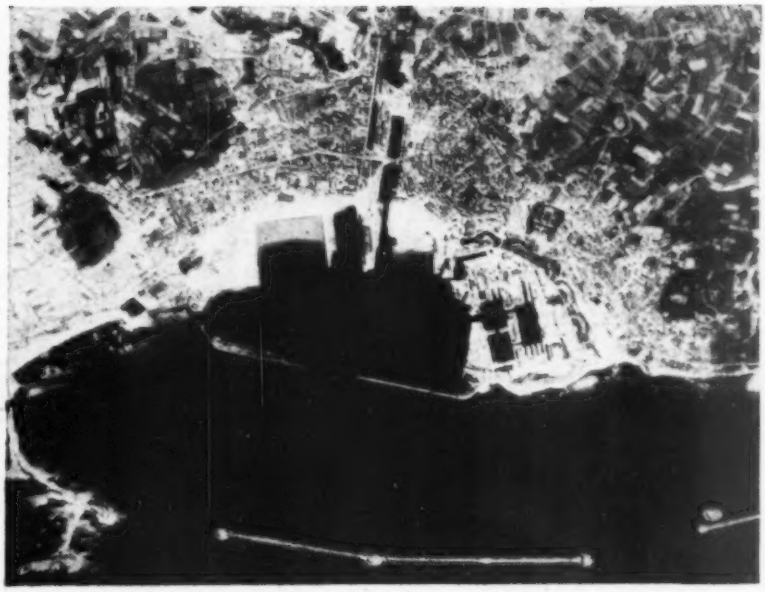
Despite the battle in Normandy, the strategic bombers from Great Britain have continued to belabour German centres, and the U.S. 8th Air Force was accompanied by Mustang fighters during its heaviest daylight attack to date on Berlin. After performing their mission, both bombers and fighters flew on to bases in Russia which had been prepared for them, making a flight of over 1,500 miles.

There are obvious drawbacks about preparing a shuttle service of this sort, as it implies duplicating all the facilities of the home base in a distant country. But when these difficulties have been overcome, there are also advantages in this method. It avoids the strain of the return journey, and confuses the German defences.

The Russians were doubtless delighted to welcome the Americans on their soil, and must have been much impressed by the mighty day-bombers. Still, it is certain that the Russians are more excited over the landing in Normandy—the Second Front, for which they have been clamouring for so long—than over any amount of strategic bombing. Red airmen have exclaimed with enthusiasm that they hope in time to be with their Allies in the centre of Berlin, and they were probably thinking of occupation rather than of raiding.

Three in One

THE American advance up the peninsula to Cherbourg provided the best example which this war has seen of close co-operation between the three Services. The defences of the town were pounded in turn by aircraft bombs, by the ships of the Fleet, and by ground artillery. Yet still, as in the past, it was the infantry which had to exploit the preparations of the triple bombardment, and strike the final blow. Escape for the garrison was impossible, and aircraft dropped leaflets to tell the Germans so. Ships which tried to sneak out were intercepted by naval forces and either sunk or driven into the harbour of Alderney.



CONTINENTAL FRONT DOOR: An aerial photograph of Cherbourg showing the layout of the docks and breakwaters.

Hitler, knowing that the divisions in Cherbourg were lost to him in any case, ordered them to fight to the last man. What did it matter to him whether they were killed or made prisoner, as they could be of no further use to him? But when men run out of ammunition, they can fight no longer, and surrender is the only possible ending to the matter.

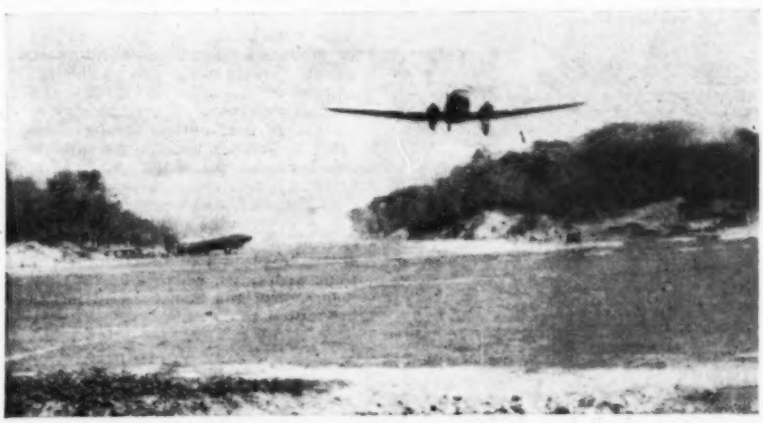
Unfortunately, we cannot say with Deborah and Barak that the stars in their courses fought against Hitler. Rough weather on the beaches delayed the landing of stores and munitions, and the weather of this deplorable June also slowed things down in Italy. There were days when all the Allied aircraft were grounded except the fighters and fighter-bombers. When the weather was clear there were a number of bombing raids on the south of France, and also on enemy positions in Yugoslavia. So the German leaders must be kept guessing whether General Alexander will strike to the west or to the east or in both directions when he has gained control of the north of Italy. The capture of Elba by French troops, supported by British and American aircraft, combined with the fact that Corsica is firmly in Allied hands, suggests a coming landing in the south of France; and this would not rule out a simultaneous advance into the Balkans. One may picture Rommel imploring Runstedt for more reinforcements to meet the Allies in Normandy, and the latter wondering whether he dare withdraw any reserves from any of the other fronts.

General Advance

AS had doubtless been arranged at the Teheran conference, the Russians seized the moment of the invasion in the West to attack in Finland and also round Vitebsk. In Finland they rapidly seized some useful airfields and used them for overhead attacks on the Finns. Doubtless the Stormoviks and other types are also busy on the Vitebsk front.

Between the Marianas and the Philippines the U.S. Navy has had a fight with a powerful Japanese fleet. The latter would not come to grips, and the engagement resolved itself into a duel between the aircraft of the carriers. The enemy lost heavily in ships and aircraft, and then fled.

The British fleet of the S.E. Asia Command carried out an air attack on Port Blair in the Andamans with success.



FAR EAST AIRFIELD: Dakota transports operating from an air strip newly cut from the jungle in Assam.

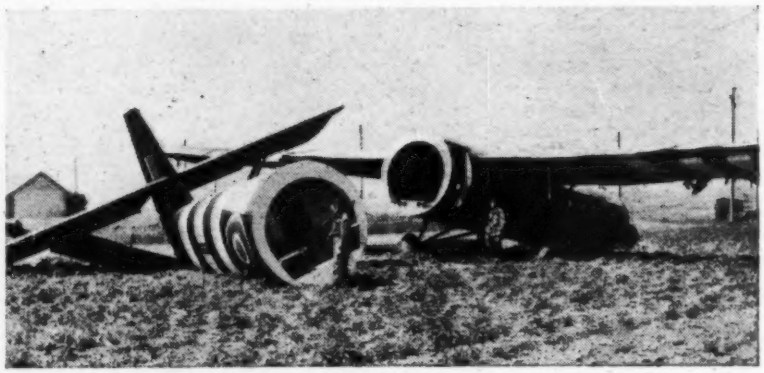
HERE AND THERE

Vaccines by Air

DUTCH aircraft are carrying anti-pest vaccines to Naples and Genoa. They are flying via Gibraltar, where one plane arrived recently with over 100 boxes of them.

Training Honour

HER MAJESTY THE QUEEN OF THE NETHERLANDS has appointed Wing Cdr. R. D. Stewart, R.A.F.V.R., to be a Commander of the Order of Orange-Nassau with Swords. Wing Cdr. Stewart is assistant director-general (commercial) of British Overseas Airways Corporation, which he joined last December. He previously commanded a Training Wing of the R.A.F., and the honour bestowed upon him by Queen Wilhelmina is in recognition of his services in training Netherlands Air Force personnel.



BROKEN BUT NOT "BENT": Unloading is greatly facilitated by disconnecting the rear fuselage portion of the Horsa glider. In gliders of this type men of the Sixth Airborne Division established invasion bridgeheads.

Different Freedoms

THE Moscow newspaper *War and Working Class* recently declared that "Freedom of the air after the war, carried to its logical conclusion, is fraught with the very real possibility of detriment to the security of some countries."

Drawing a distinction between freedom of the seas and freedom of the air, the journal added: "Air space extends *over* State territory while sea space, excepting territorial waters, lies *outside* national boundaries."

Youthful Leadership

THAT British aviation shows visible signs that the effective age of leadership in this country may drop by as much as twenty years or more in the decade following this war, is the opinion expressed by Mr. Kenneth R. Wilson, Ottawa editor of the Canadian *Financial Post*, in a recent pamphlet entitled "Post-war Britain."

With seven other Dominion journalists he toured Britain last spring, and he refers to the day he spent at Prestwick Airport as "one of the most exhilarating days of the entire trip."

This airport he describes as "perhaps the most important flying centre in the world to-day," and adds that the two young men responsible for it, the Duke of Hamilton and David McIntyre, are "already a decade or so ahead in their thinking."

B-29 Task Forces

THAT the new B-29 Super-Fortress may soon be seen in Britain is hinted at in a recent statement by Gen. George C. Marshall, U.S. Army Chief of Staff, in which he said that the power of these bombers is so great that the Joint Chiefs of Staff felt it would be uneconomical to confine them to a single theatre of war.

They would therefore be treated as major task forces and their bombing operations be directed throughout the world under centralised control.

Stretching a Point

AN extra 2oin. of fuselage between the rear of the cockpit and the fin has been added to the latest Warhawk, the P-40L. The object is to improve control.

No "Ring"

FROM Mr. E. C. Bowyer, chief of the information department of the Society of British Aircraft Constructors, we have received the following:—

"Your leader note last week, on recent allegations of the existence of an aircraft manufacturing ring between the wars, might have been read by those who are not in a position to know to the effect that an aircraft ring was indeed in existence. As you know, that in fact was not the case, and I shall be glad of the courtesy of your columns to reaffirm the Society's categorical disclaimer.

"The Society, which is the only organisation representative of the aircraft industry as a whole, was constituted with Government approval in 1916 to provide a means of consultation between Government and industry on matters of principle, and to forward the general well-being of the industry. The Society is not, and never has been, a 'ring.' It does not discuss, and never has discussed, prices for aircraft, engines or of any item of aircraft equipment. It does not deal, and never has dealt, with the allocation of orders, nor with the control of output. It cannot interfere with the placing of orders or specifications with firms, whether or not they are members of the Society, and has never attempted to do so."

AMERICA'S NEW NIGHT FIGHTER: Nicknamed the "Black Widow" this Northrop P-61 is powered by two Pratt and Whitney engines and has a tricycle undercarriage.

R.A.F. Versatility

ON one of the French airfields now being used by the 2nd Tactical Air Force, it is reported that the dental officer, when he has no R.A.F. teeth to stop or pull out, spends his spare time in

HERE AND THERE

a boiler suit working with the maintenance men on the aircraft.

This is but one instance of the enthusiasm and versatility of R.A.F. "invasion" personnel in general, for every man, be he cook, clerk or wireless mechanic, has to know how to refuel and re-arm his unit's aircraft, and be able to drive a variety of motor vehicles up to a three-ton truck.

High-level Lightnings

LOCKHEED Lightnings are now being used by the U.S. Eighth Fighter Command as high-altitude precision bombers against targets behind the German lines in France.

The P-38's carry up to 2,000lb. bomb-load and employ precision bombing technique from more than 20,000 feet.

Cross-Channel Ferry

MORE than 1,000 aircraft are being operated by the Transport Command of the A.E.A.F. between this country and Normandy in support of the Allied invasion Forces, it was disclosed recently.

"Some of the 30-ton cargoes carried include jeeps, motor trailers, howitzers and 500lb. bombs," the Press Association announced.

Queenly Interest

QUEEN WILHELMINA of the Netherlands recently flew to an advanced base of the Tactical Air Force to visit a Dutch Mitchell squadron, talked to her pilots about their part in the air assault on Europe, and held an investiture.

The squadron commander received the Dutch D.F.C. with Honorable Mention (equivalent to the British D.S.O.) and fourteen other members of the squadron received the D.F.C.

Swell Joint!

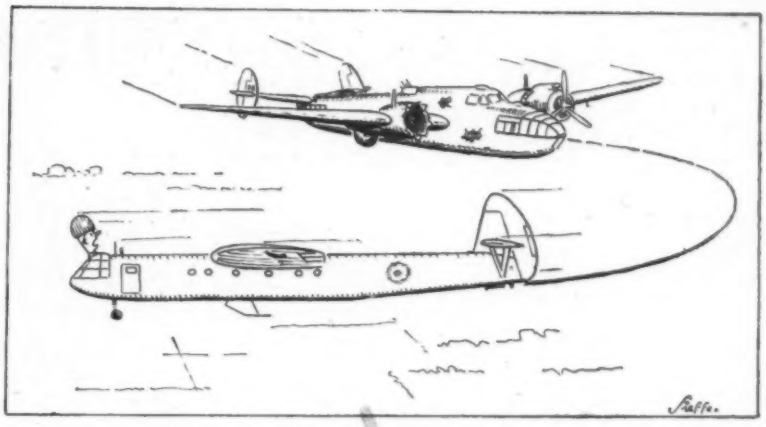
A STORY comes to us by way of *Aero Digest* of two Fortresses called "All American" and "Little Eva." The first B-17 collided with a German fighter in combat and came home with its tail nearly severed, while the other had its nose smashed in.

The ground crew, not wanting to scrap both Fortresses, joined the two good halves together and this machine, named "All American Little Eva," is now back on operations again.

A.A.E.T. Exams.

EXAMINATIONS for admission to the Association of Auto-Electrical Technicians are to be introduced as from October 1st this year.

The association, whose scope extends to aeronautical electrical engineering, was formed in 1940 when conditions caused the question of examinations for admission to be shelved.



"Not at all old man – it's the least we can do"

Applicants should write to the secretary, Mr. C. C. Feldman, 19, Church Crescent, Whetstone, London, N.20.

Chance in a Million

IN a case recently reported from County Down, evidence showed that a young man threw a stone at an aircraft, the airscrew was struck, and was so damaged that the pilot had to make a forced landing.

As an illustration of the phrase, "A chance in a million," this would be hard to beat, especially when one reflects upon the vast amount of scientifically directed A.A. fire which never hits anything.

Incidentally, the thrower and his two companions were each fined 5s.!

Air Chief Marshal Sir Charles Portal, Lady Portal, and Sir Louis Greig leaving St. Martins-in-the-Field after the memorial service to the R.A.F. men shot at *Stalag Luft* III.

U.S. Air Pictures in Moscow

A PHOTOGRAPHIC exhibition entitled "The Bombing Aviation of the United States" was opened at the Architects' Club in Moscow recently.

Sponsored by the Soviet Society for Cultural Relations with Foreign Countries and with the co-operation of the U.S. Ambassador, Mr. Harriman, the exhibition comprises over 60 large photographs depicting various types of American bombers and the results of their activities against the common enemy in Europe.

Reviewing the exhibition, the *Soviet War News* says that it "testifies eloquently to the might of American bombing aviation as well as to the courage and great skill of the airmen."

Bristol Blood Donors

WHEN the Army Blood Transfusion Service, which has its headquarters at Bristol, found itself in need of blood to save the lives of Allied troops during the first days of the invasion, it sent an appeal to the Bristol Aeroplane Co., where a planned organisation was ready for such a call.

In the first 36 hours 1,410 men and women employees of the firm had given all the blood required at the factory medical posts, and it was flown to France for immediate use at the advanced dressing stations. By the Saturday morning 2,500 Bristol workers had given their blood.

Incidentally, well over 1,000 casualties were flown back from Normandy in a recent period of six days, in transport aircraft carrying W.A.A.F. and R.A.F. nursing orderlies.

It has been stated that these aircraft do not bear the Red Cross because they take supplies to France on the outward trip, but with complete Allied air supremacy they do not need such protection—if protection it really is!

There have been too many incidents which suggest that the Red Cross by no means guarantees immunity from Nazi fire, any more than from Jap bullets.

D

Invasion Close-up

Air News from the Notebook of Our Correspondent with the Allied Expeditionary Air Forces

BOMBER COMMAND has destroyed one of Coastal Command's sources of kills. For some time past E-boats have been operating from Continental ports against our invasion shipping. Every night Coastal Command used to find and attack these 40-knot motor torpedo boats, but after a colossal attack on Boulogne Harbour by Bomber Command scarcely an E-boat has shown up. I went out last week on one of these E-boat patrols with Wing Cdr. Ruttan and his aircrew of an R.C.A.F. Squadron.

Way back in 1940, strangely enough, I visited the same Coastal Command airfield and wrote an article under the heading of "Eggs and Bacon and Operations." In it I referred to satellite airfields, which were then a close secret, and a severe censor turned down the whole article mainly for that reason. For this operational trip I went to the same airfield, ate considerable quantities of eggs and bacon and started for the patrol from the offending satellite.

It was not really Wing Cdr. Ruttan's turn to go on ops but he paid *Flight* a handsome compliment by broadcasting for his crew and deciding to come himself. (Wing Cdr. Ruttan commands the Squadron.) Preliminaries were soon fixed up and briefing took place in the operations room under the eye of Group Capt. Busk, who commands the station. He regarded me, or rather my mission, with polite disfavour. His precious trained aircrews, let alone the star performers, were not to be "written-up" in such a manner that the dice would be loaded against them the next time they were on patrol. Obvious omissions in this story I hope the reader will understand, and for any change of sequence or place I know the aircrew will forgive me.

Brief Briefing

The patrol being quite a standard one, the briefing took but a short while. Our route to the area was given to satisfy A.D.G.B. and our free bombing area delineated to prevent us from attacking our own ships. Next the "met" officer gave his little piece. Visibility 10 miles, north wind 25 m.p.h., cloud 2,000ft. 5/10 to 9/10. As a final thrust he said the icing level would be at 6,000ft. Flaming June, where are you? The signals officer gave out all his secret "gen," and we adjourned to the mess for an operational meal of eggs and bacon and chips. After a hearty meal a move was made to gather kits and proceed to the satellite airfield. In a very complete outfit a pair of oversize sheepskin-lined flying boots had been included, and I was soon able to perform the aircrew shuffle. On arrival at the satellite station I was introduced, appropriately enough, to Wellington J-for-Johnnie. It also rejoiced in the name of "Jackass Serenade," perhaps even more appropriate, and symbols for four sunken E-boats were painted on the fuselage.

A Full Wimpey

That Wimpey was one of the fullest things that ever took the air. A crew of seven normally, and a passenger to-day, together with an incredible amount of equipment —referred to as junk—filled that geodetic tunnel in a manner undreamt of by Vickers-Armstrongs, Ltd. We were soon off, with me comfortably installed in the second pilot's seat. Doing a gentle 150 knots on the clock with +½ boost and 1,900 r.p.m., the trip over our lovely English countryside to our final point of departure came as a distinct anti-climax after all our warlike preparations. We cruised along at only 1,000ft. with the fields below all golden in the low evening sun. Here are four playing tennis, there boats on the river—just little patches of sanity in a mad world. Suddenly on our port bow 15 Mustangs with U.S. markings rose up out of the ground. What job were they on, I wondered? A sixteenth, quite oblivious of our presence, did a neat roll across our front and joined the rest of his party.

All the time scraps of conversation come over the "intercom," but a more serious note has crept in. Each is checking up on his particular job, and quite a degree of interference is heard as the turrets are tested for rotation and aiming. Presently the airfield appears and the green "O.K. to land" light winks at us as with wheels and flaps

A German E-boat at sea. They are credited with a speed of about 40 knots and carry torpedo tubes over the port and starboard bows. Anti-aircraft armament is mostly 20 mm. calibre. The engines are three Daimler-Benz diesels.

lowered we approach at about 90 knots to touch down at 65-70 knots.

Here there is a bit of time to be spent until take-off time, and so, after a final briefing, and while the Wellington is being refuelled and bombed-up, another eight plates of operational eggs and bacon disappear. Canadian air crews' appetites are the healthiest things I have seen. I struggled manfully to keep up, but the last two chips were admittedly difficult.

At last we are on board and ready to go. The Hercules are run up, checked and re-checked. There must not be any engine failure on take-off because we weigh somewhere in the region of 29,500 lb. For over 20 seconds we roar down the 1,800-yard runway until at last we are airborne and that feeling of relief which always comes with operational take-off is evident.

Inside the blacked-out cabin, which is illuminated by the glow of orange lamps, each of the crew gets down to his job. I must say I have never met a better team. The job is on. For hours on end they must not let up for one moment. E-boats must be tracked if they are about, enemy night fighters must be put off the scent. The exact route of the patrol must be adhered to and navigation must be perfect. Two minutes too long flying on one leg of the patrol might be enough to get the aircraft into one of the most dense *flak* areas. Here I would digress for a moment and register a complaint. Flotation jacket and 'chute harness make one feel like a pouter pigeon, with the helmet, earphones and oxygen mask.

Some of the gliders which landed by the bridges at Benouville over the Orne and canal. They are actually very close to the target.

"As Daylight Faded. . . ."

To return to the patrol. We flew over the sea as the daylight faded and the luminous instruments began to show up in their ghostly fashion. Under the power eggs the exhaust showed a faint bluish purple. It did seem to advertise our presence to enemy night fighters somewhat, but since we were in 10/10 cloud a good deal of the time, we were difficult to find. All this accurate flying in cloud at night shows the absolute faith the modern pilot has in his instruments and also his skill in using them. If every window and crevice in that Wellington had been made opaque, we could have flown that patrol perfectly. Over the target area at last. Somehow the great Hercules XVIs with their big Rotol airscrews give an atmosphere of confidence as they keep up their even tenored roar. Back and forth we go searching for E-boats, ever with negative results. Bomber Command has done its work well. There is sudden excitement as we think we have a "bite," but it all dies down as it is realised that it was only a buoy. Shoal water, too, sometimes looks exactly like E-boats in formation and a careful check is made to make sure.

Like nearly all Coastal Command's work, this patrol meant hours of vigilance over a blank ocean. We could just see flashes from the invasion battlefield in the distance, and occasionally we were in the beam of a searchlight or caught sight of a small burst of flak. Of E-boats, however, not a trace.

Round and round, half after hour until the north-eastern sky begins to grey with dawn and the instruments to look less spectral once more. Our 500 lb. bombs are jettisoned in the sea as a mark of our regard to the enemy and to lighten our landing load. J-for-Johnnie is headed homeward, and eventually the friendly coast of England shows up in the half-light. One more patrol done—a blank maybe—but nevertheless a good job of work.

Sixth Airborne Division's Landing

On another day last week, at Supreme Headquarters, I heard a captain of the Sixth Airborne Division give an account of their landing in France. It is of such interest that it is given here verbatim.

"We had a mission that covered about a mile square of territory (here he motioned to an area on the wall map

Gliders of the 6th Airborne Division on the landing strips cleared by their own paratroops.

INVASION CLOSE-UP

which embraced Caen to the beaches and included the two rivers and a canal). From the photographs and from the models the whole thing was worked out in the completest detail. It is highly true that every man who landed knew exactly what he would do—he could follow each bush and hedgerow right to his objective. Well, the tasks the General gave us were these:

Four Great Tasks

"We were to land on the left flank of the whole operation, some sixty miles of which, as you now know, was going to be invaded; and we were to hold the left flank and the left flanks of the Seaborne Division was to be up the River Orne and the canal which runs by it. We were to get on the other side of the river and land there and do the following jobs:

"First of all, there were two bridges—one over the canal and one over the Orne itself. These were the only bridges between the sea and Caen and it was absolutely vital that these bridges were taken first of all. We were going to land on the other side of the river and unless we could get the bridges, we couldn't get any supplies or any reinforcements except by air. So the first job for our own sake was to get these bridges.

"The second job was to get a coastal defence battery. The coastal battery up at Franceville Plage has four guns. They were embedded in terrific concrete emplacements. The R.A.F. had bombed them day and night for months before our landing, and the concrete was so thick they hadn't made any impression on them at all. These guns could shoot right along the coastline for several miles (motioning on the map in a westerly direction over our selected assault beaches), and our orders were that before daybreak, actually 7.30 o'clock when the seaborne invasion was due to come, these guns were to be put out of action. That was the bridges and the battery.

"The third task was to blow all the bridges on the Dives River so that the Germans couldn't get reinforcements across.

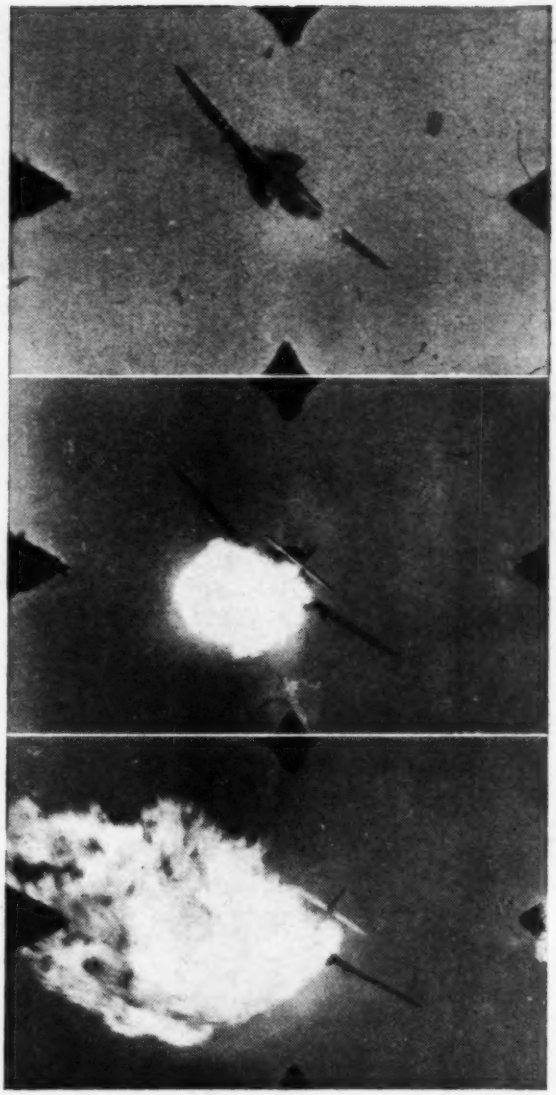
"Lastly, we had to seize the whole of the high ground around the area just east of the bridges across the canal and the River Orne. We had to hold that and keep it at all costs. Nothing was to be allowed through—and nothing was! Those were the jobs we had, and the plan for us to carry out was on these lines.

The Bridges

"The first thing was the bridges, and the second the battery. The General considered that these had to be done together, and the idea was that if Parachute Troops were dropped they would be seen dropping down, and by the time they sorted themselves out and got to the bridges Jerry would have had ample warning and would have blown the things up before we could get at them; so the General conceived the idea of sending gliders to take them—a total of 180 men—and his orders to the glider pilots was to land right in the two small fields on either side of the bridges. They were very small fields, with large trees on each side—a very little space to get into there. If necessary, the gliders were to crash into the bridges to stop themselves. They were to come down and crash into the bridges. That was how that was to be done. This, and the taking of the batteries, was all to be done together, right at the beginning.

"The batteries were heavily wired and heavily mined all the way around. He was going to shove a battalion of paratroops against it to break through and put these out of action—but then, because the wire was so thick and the mines so heavy, he thought probably it would be tough getting through, and they were bound to have them covered by fire.

"As a diversion he arranged for three gliders to be crash-landed on top of the batteries inside the wire and mines.



A graphic sequence of an aerial combat between an American fighter and an Me 109. (Top) Lined up in the sights. (Centre) A blinding flash as the drop tank of the Me bursts into flames. (Bottom) Just a huge plume of flame before crashing.

It was the idea for them to crash on top of the battery so that the men could stream out and play hell, and while this went on the other men were to get through. The bridges were to be held by the Engineers then, and the rest of us were particularly to get a hold of all this high ground and to stick to it. (He motioned to the ground between River Orne and canal to Dives.)

"Well, it worked pretty fine all the way through. Everything was done long before daylight. I think about two or three hours after the paratroops were down, and the first 20 gliders were down there, the whole issue was done. This part worked splendidly; everything went according to plan. One of the gliders went wide, but about five landed around the bridges—got out—and before the Germans had a chance to wake up the bridges were taken. They had all been seized. On the bridges I believe there were only two men doing nothing in particular—they were guarding. This bridge over the Orne, that was taken

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easily. The canal bridge they had to fight for, but they soon got it.

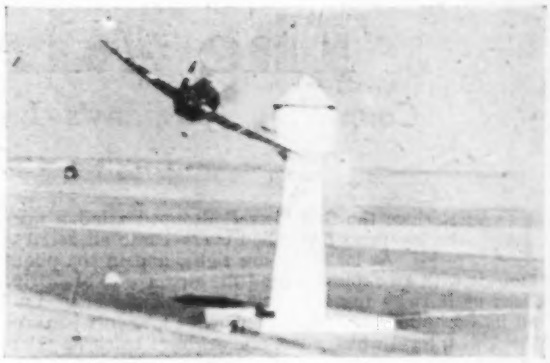
"I didn't go with the paratroops to the battery, but it went well as well. A war correspondent who went with them went in a glider which didn't land in the right place, but the battalion had good luck. The R.A.F. had been there and had bombed it just before, and they had blown up a lot of mines and the wire. They had some opposition while they landed, but when they got outside the wire they came up against stiff opposition. There were some casualties. They took the battery, the guns were all demolished, and the paratroops got out and cleared out again.

"They had done their job, and they must get back to the bridges.

"These bridges" (pointing to the one on the Dives River near to the seashore) "I didn't go to; I know they were blown up. They blew up the bridges on the Dives River, and the high ground all around here was taken" (motioned to map to area between Dives River and the other two waterways).

"Originally there was not a great deal of opposition, but the opposition came the next day, and the day after it came thick and fast; but on the first day I think we got them when they were completely surprised. It is rumoured, and I think correctly, that the troops in this area were either young boys or old men who were out on an anti-invasion exercise on the night we landed. So I don't know whether they had taken blank ammunition or what, but they were out on an exercise. Some of them weren't quite intelligent and didn't catch on. Two of them were still in bed on their own in the village of Franceville Plage, which is more than could be said of some of them.

"The paratroops who had already landed before us did a wonderful job. They cleared the 'poles,' and they got a marvellous landing strip ready for us—and when we came in quite a lot hit the landing strip and quite a lot didn't.



Close-up of a P47 attacking a German flak tower, taken by the automatic recording camera of the next attacking machine. The photographic quality is remarkable.

Quite a lot landed with their noses in the ground and their tails in the air, including the General!"

An opportunity presented itself to see some of the combat films taken by the automatic cameras carried by the American fighters. This obtaining of photographic evidence is a little trick which they learnt from us during the Battle of Britain. They have now, however, gone a long way past anything the R.A.F. turn out. The most our people hope for is just a muzzy outline where the U.S. pictures have definite photographic quality, and a large proportion of them are taken in natural colours.

Another feature which we do not share with the Americans is that the camera runs at 64 pictures a second and the projector at 16 pictures a second. This makes an air battle sequence last just four times its actual length: an exciting feature when ground strafing is portrayed. It makes it appear as if the pilot is dawdling over the enemy airfield at round about stalling speed. To see an Fw. 190 receive the strikes from converging 0.5in. bullets and blow up in one great black and orange mass is more thrilling than anything Hollywood ever produced.

SWITZERLAND'S AIRCRAFT INDUSTRY

HARDLY noticed by the outside world, the Swiss aircraft industry has grown during the past few years from modest beginnings to a relatively considerable size. To-day it employs 5,000 workers, mostly specialists, and 650 engineers, technicians and administrative staff.

The production of the aircraft departments maintained by different industries to-day covers a wide field, ranging through fuselages, wings, undercarriages, engines, airscrews, controls wireless equipment and armament.

At present the *raison d'être* of this development is the orders for the Swiss Air Force and the absence of foreign competition; there is little doubt that the new industry has acquired a quite considerable position in the Swiss economy.

The problem of maintaining the industry after the war, and the readjustment of the industry to post-war civilian requirements, is now being considered with some apprehension.

A memorandum of the Association of Swiss Aircraft Manufacturers, which embraces about a dozen firms, lays down the requirements of the industry for possible post-war development.

Stating that aircraft production is particularly suited to Swiss technical skill and workmanship, the memorandum rejects any idea of limiting its scope to component production. Only complete production can spur on the industry to a sustained progress, it is said.

The memorandum points out that difficulties are presented, not by technical problems, but by marketing. Without purposeful State assistance the small Swiss market cannot provide a durable basis for Swiss aircraft production. But while the idea of direct subsidies is strongly objected to, the memorandum suggests that all orders of public bodies should be placed with the local industry, provided the latter is capable of delivering products of a quality equal or similar to that of foreign firms. These proposals are on the lines of the policy of public transport companies, such as the Swiss Federal Railways, which procure their rolling stock and transport vehicles from local first-rate firms.

The memorandum demands that a construction programme for the entire aircraft industry should be adopted with the co-operation of the Swiss Government. For this purpose the formation of a special committee is advocated, to be composed of representatives of the Federal departments concerned, industrial and scientific bodies, which should have sufficient powers to make decisions, including financial ones, and to supervise the development of technical research.

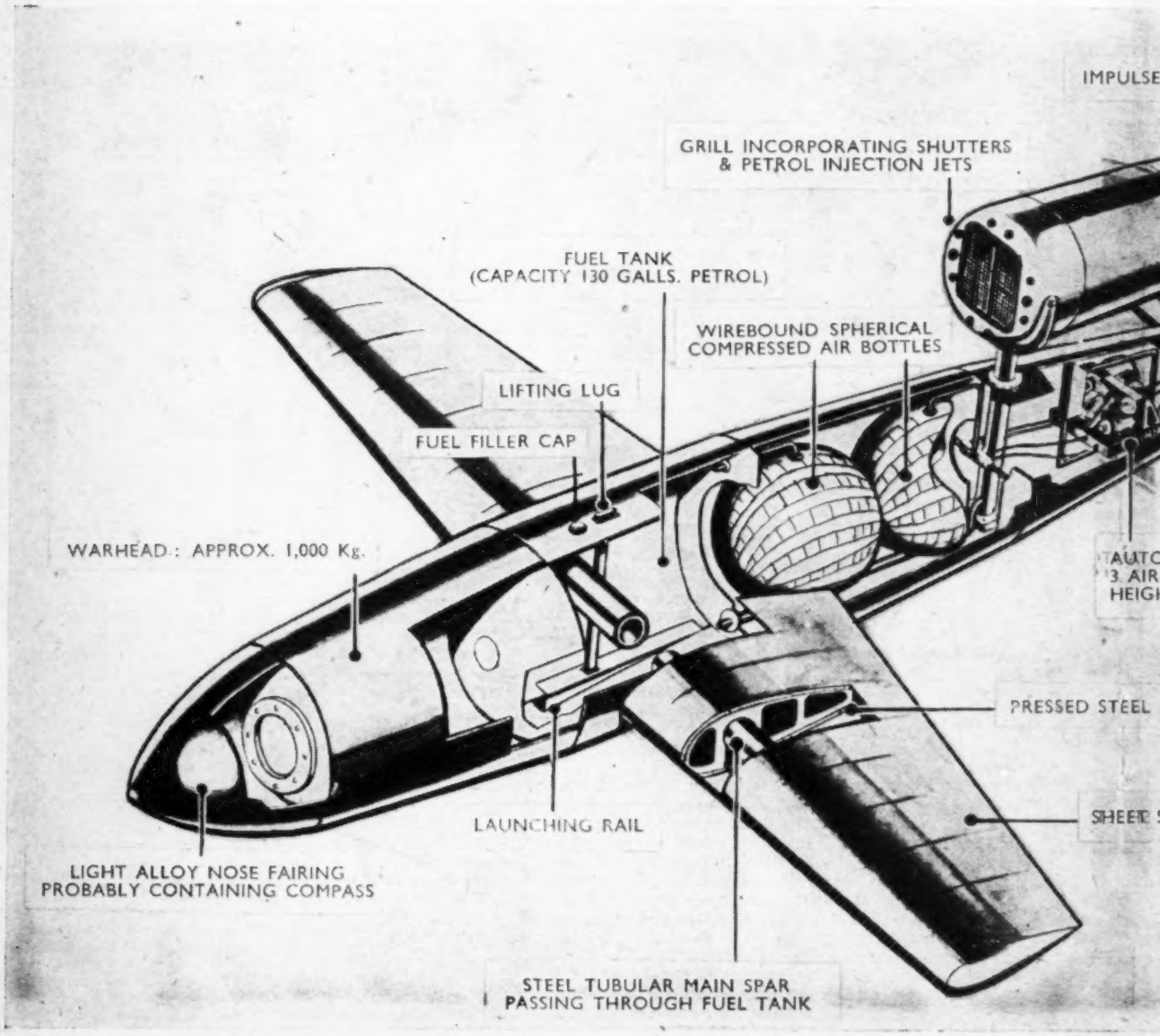
FIRST PICK-UP IN NORMANDY

WHAT may be the beginning of more rapid "turn-round" for gliders occurred the other day in Normandy, when four gliders, carrying between them two and a half tons of letters from soldiers, were picked up by C47 Skytrains from a small clearing in a wood. The Americans have, of course, been experimenting with flying pick-ups of smaller gliders for several years, and pick-up air mail services are in regular operation in the United States. This, however, was the first time that gliders of the large type used in the invasion have been picked up from a base in France. The advantage is, of course, that the tug aircraft does not have to land, so that provided there is room to climb after the glider has been picked up, any sort of field with any sort of surface can be used. A Nylon rope is used because of its shock-absorbing properties.

The Air Torpedo

Countering Germany's Latest Weapon : Details of Jet Engine : Flying Qualities

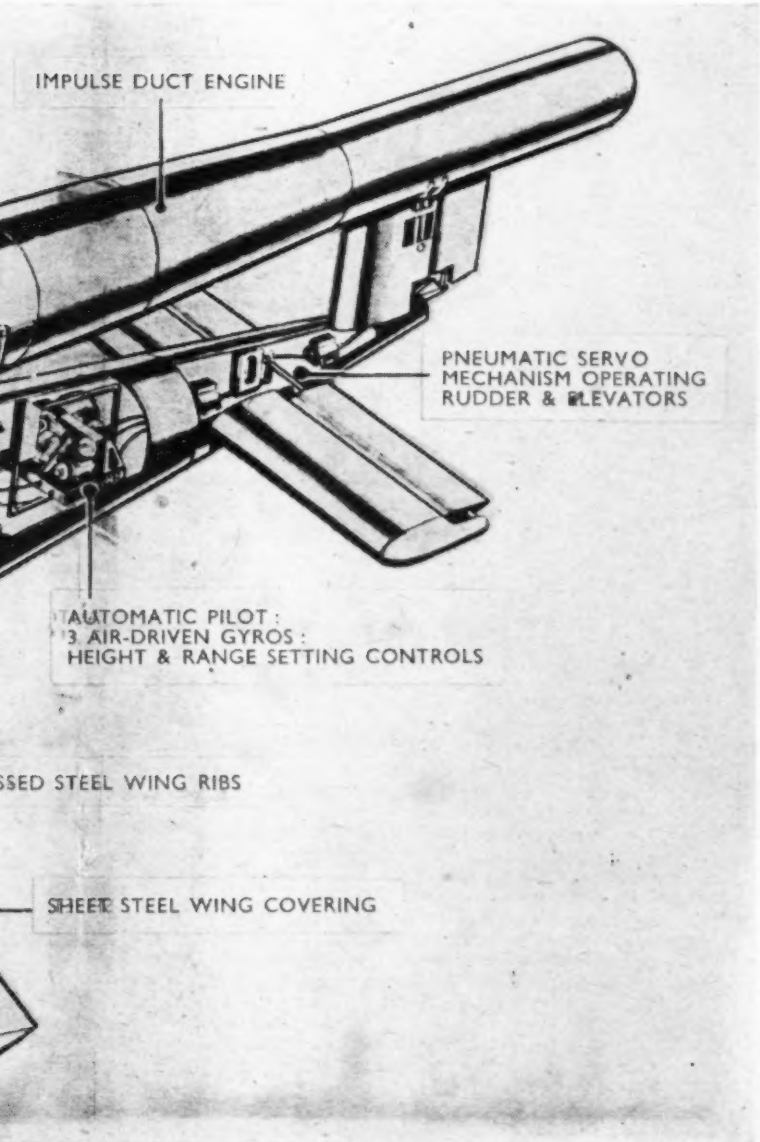
EVER since the first aircraft dropped a lethal missile the lay press has called every bomb an aerial torpedo. At last they are right, and in the pilotless aircraft with an explosive head the air torpedo has arrived. Used as it is by the enemy it is completely blind and as an indiscriminate weapon of terror it represents just about the lowest level which the Germans have reached. Nevertheless, despite some inconvenience and some sad tragedies it will, without doubt, become recognised eventually as the biggest flop or the dampest squib the Herronvolk has yet launched. Friend Goebbels runs a super full-scale propaganda attack while the crewless division of the *Luftwaffe* attempts to struggle along with less than 25 per cent. of its original programme. Air Marshal Sir Roderic Hill's A.D.G.B. pilots are knocking them out of the sky at a goodly rate. One Tempest squadron, under the command of Sqn. Ldr. Dredge, D.F.C., already has a large kill to its credit, and a New Zealand squadron, also with Tempests, under Sqn. Ldr. Ironmonger has a fine bag. At night the air torpedoes advertise themselves by the flare of the jet, and Mosquito night fighters take a good toll. In fact, the first to be brought down was shot out of the sky by Flt. Lt. Gothorpe, a Mosquito pilot of the County of Warwick (A.A.F.) squadron. The tactics of attack were first laid down by Wing Cdr. Beamont, and Flt. Sgt. Rose destroyed the first one in daylight. At first attacks were


IMPULSE
GRILL INCORPORATING SHUTTERS & PETROL INJECTION JETS
FUEL TANK (CAPACITY 130 GALLS. PETROL)
WIREBOUND SPHERICAL COMPRESSED AIR BOTTLES
LIFTING LUG
FUEL FILLER CAP
WARHEAD : APPROX. 1,000 Kg.
PRESSED STEEL
LAUNCHING RAIL
LIGHT ALLOY NOSE FAIRING PROBABLY CONTAINING COMPASS
STEEL TUBULAR MAIN SPAR PASSING THROUGH FUEL TANK

made from 400 yd., but gradually the range was closed until as close as 150 yd. Approach is often made from the rear, and the 20 mm. cannon fire either wrecks the jet engine, puts the gyro pilot out of commission, or explodes the bomb. When the air torpedo is shot down and explodes on the ground, the pilots say they can see a ring of blast as it spreads outward from the explosion.

If the torpedo is exploded in the air, the attacking aircraft has to fly through the blast. Almost invariably the pilot finds himself upside down on the other side, with the fabric burnt off the Tempest's rudder. The pilots say that when one is exploded in the air it appears as if the sky erupts in a great orange and black flash. Obviously the blast waves are travelling at a speed greater than that of

OFF THE SECRET LIST: Examining the remains of a pilotless aircraft shot down over the south of England.


IMPULSE DUCT ENGINE
PNEUMATIC SERVO MECHANISM OPERATING RUDDER & ELEVATORS
AUTOMATIC PILOT: 3 AIR-DRIVEN GYROS: HEIGHT & RANGE SETTING CONTROLS
SSED STEEL WING RIBS
SHEET STEEL WING COVERING

sound, and it is only because modern fighters are stressed to withstand compressibility effects that so little damage occurs. Meeting the explosion head-on also presents a much smaller area to be affected. As we stated in our issue of last week, there are definitely two distinct types. There is the normal square-winged type with an average speed in the neighbourhood of 350 m.p.h., and also a rather bigger aircraft which has curved and swept-back wings. This second type is some 35-60 m.p.h. faster.

The square-winged type is 21ft. 10in. long, with a maximum width of 2ft. 8½in., while the overall length of the missile is 25ft. 4½in. and the wing span 16ft.

The range of the type at present in use is about 150 miles, the speed in level flight between 300 and 350 miles an hour, and the explosive power equivalent to a 1,000 kilogramme German bomb. The explosive is carried in the war-head, mounted in a thin casing in the front part of the fuselage. Constructed almost entirely of steel, the projectile is coloured with the usual type of German camouflage —dark green on top and light blue underneath.

Gyro-Controlled

It is not radio-controlled, but operated by an automatic pilot, set before the take-off. Once the missile has been launched, therefore, the enemy has no control over its further movements. It has a rudder and elevators but no ailerons. The wings are set at about 8 degrees of dihedral. It is not possible to assess the power loading but the wing loading is in the region of 80-100 lb. per square foot.

When all is working properly, the air torpedo flies a straight and level course, but if anything untoward—such as a 20mm. shell—happens to the automatic pilot gyros, the weirdest evolutions are performed. This has occasionally happened in air combat and the Tempest, for all its manœuvrability, has been quite unable to cope with a mechanism gone mad.

These air attacks were planned to take place many months ago, in order to divert the impact of the Allied Air Forces on German communications and industry, and to raise the morale of the German people. Nearly a year ago all German propaganda stated that it would be launched quite soon. Measures were promptly taken to counter this threat. The German experimental station at Peenemunde, for example, was attacked by the R.A.F. Bomber Command on August 17th-18th, 1943, and the serious damage and many casualties inflicted caused a severe setback to the highly important activities being undertaken there.

Moreover, factories and plants manufacturing special weapons, notably works at Friedrichshafen, were powerfully attacked and damaged. Heavy assaults were also made by R.A.F. Bomber Command and by the United States 8th and 9th Air Forces on the enemy's war produc-

THE AIR TORPEDO

tion centres where various component parts were being manufactured.

Meanwhile throughout the past year thousands of air photographs of Northern France—covering many hundreds of square miles and forming a photographic map—were taken by reconnaissance aircraft. The construction of discharge points for these air torpedoes was detected and subsequently watched, and it was realised that from these installations, each consisting of a launching ramp and scattered small buildings, formidable attacks on England would be possible.

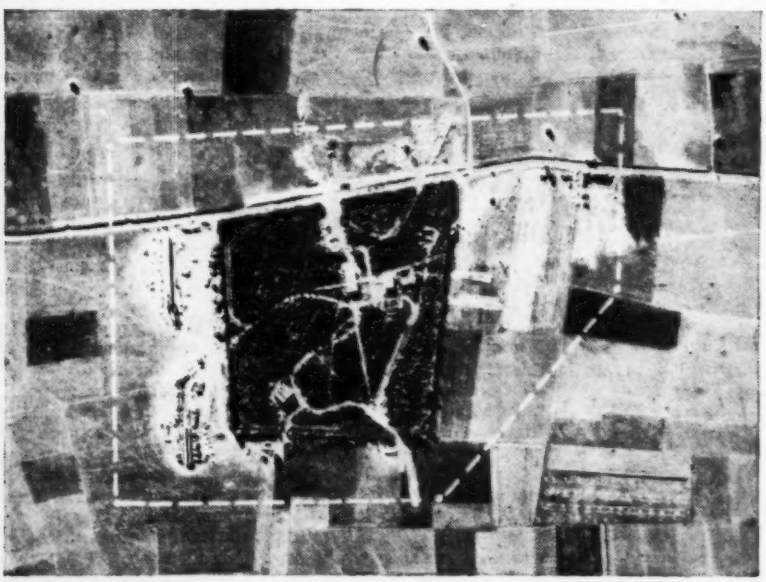
Bombing the Launching Ramps

Heavy bombing attacks on the launching points were begun in December, 1943, by R.A.F., United States, Dominion and Allied Air Forces and were continued as weather and other operational requirements permitted. These attacks were made in addition to the already numerous commitments which those forces had undertaken to ensure effective Allied invasion of Normandy and the subsequent penetration of the Allied armies into the mainland of occupied France. Since the end of last year tens of thousands of tons of bombs have been dropped on the launching points, and photographs show that most extensive damage was caused to them, despite the fact that sites were small and scattered and offered a difficult bombing target.

As a result of this persistent offensive, there has been dislocation of the widespread effort which the Germans have been making to assail Britain with the new types of missile. A great number of the camouflaged sites and supply depots were destroyed or damaged, and the enemy's repair work on them was disrupted by renewed attacks from the air. Thus serious delay was imposed on the enemy, and when, therefore, he eventually launched his attack it was on less than a quarter of the scale which he had originally planned.

The catapult ramps from which these air torpedoes are rocketed off are in a 100-mile belt some 20 miles in depth. Some have been captured in the invasion area. They appear to have no traverse, and perhaps selection for use is made according to target and wind direction. It is thought that each ramp can discharge one aircraft about every 40 minutes. Each site is about 200 yards square, and, to use a rocket-projectile Typhoon pilot's expression, they are fitted with 10/10ths *flak*.

SINGED: Flt. Sgt. R. Cole examines the burnt fabric on his rudder after flying through the blast of an air torpedo which he exploded in the air.



PILOTLESS AIRFIELD: One of the first discharge ramps found by the R.A.F. The bomb store is in the buildings outside of the wood.

The jet-propulsion unit is of particular interest, as it is of the compressorless type, whereas most recent developments, including German designs, have incorporated an engine- or turbine-driven air compressor. In so far as it may be said to follow earlier types, it most nearly resembles the projects of the French engineers, Mélot and Leduc. It may be recalled that Mélot units were demonstrated to the French military authorities in the last Great War. The experiments were discontinued, as presumably the results were inconclusive.

From the information at present available, it appears that the unit comprises a tube of welded steel approximately eleven feet in length. At the forward end is a large air intake in which is mounted a multiple flap valve resembling a series of unbalanced shutters. Behind the valve are the fuel sprayers, and farther to the rear is a venturi with the ignition plug located in the centre.

The fuel used is petrol, and 130 gallons are carried in wing tanks. It is fed under pressure to the fuel sprayers by compressed air stored in

THE AIR TORPEDO

two spherical wire-wound bottles carried in the fuselage. Thus the quantity of fuel delivered is to some extent dependent upon the pressure in the air-storage bottles, and this consideration probably gives a clue to the widely varying reports of the speed of the craft. In the early stages of its flight it unquestionably travels at 300-350 m.p.h., whilst towards the end of its flight a speed of 200-250 m.p.h. appears to be more usual. It is not clear as yet whether the compressed air is used merely to transfer the fuel under pressure, or whether it is at the same time mixed with the fuel to atomise it upon injection.

According to reports, the operation is as follows: Due to the forward speed of the craft, air is rammed into the propulsion duct and into this somewhat compressed air the fuel is injected and ignited. Whether injection is continuous and ignition periodic, whether the igniter is a continuous glow plug and injection periodic, or whether both injection and ignition are periodic, is not clear. In a relatively confined space there is an explosion giving a sharp rise in pressure which closes the flap valve at the intake, and the combustion products are violently ejected from the rearwardly directed propulsion nozzle. As the internal pressure in the propulsion unit falls, the flap valve will be opened by the surrounding air stream and a new charge of air will be rammed in the unit and the operation repeated. Thus arises the characteristic pulsating note which, on first acquaintance, sounded strange for a jet-propulsion plant.

The absence of a compressor, intermittent instead of continuous operation, the use of an automatic flap valve and the method of fuel injection are factors which individually and collectively would seem to indicate a relatively low efficiency. However, this is doubtless a minor consideration as the range is restricted and the working life is extremely short, say, half an hour. To save weight, material and production time, both in manufacture and assembly would be much more important in an alleged military weapon of this character than the attainment of thermal efficiency. As the functioning of automatic valves is so lacking in precision (they were discarded on motor cars nearly 40 years ago) it would seem that long research and experiment has been necessary to secure anything approaching consistent and reliable operation.

The duration of flight is determined by a time switch which, possibly, trips the automatic pilot and puts the craft into a steep dive. Of course, insufficient pressure in the air bottles or complete consumption of the fuel, whether deliberately arranged or resulting from gunfire, will also terminate the flight. The varying descriptions of the final behaviour of the craft—power dive, powerless glide, sharp cut-off, faltering or gradual fade-out of the propulsion unit—would be accounted for by these considerations.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Appointed

GEN. PAUL MONIOT has been appointed Secretary-General for the French Air Defence, a new post just created by the Vichy Government.

Tin Foil

A GERMAN air expert, quoted by the German Overseas News Agency, tonight stated: "The tinfoil strips which the British until recently dropped in great quantities on Germany during their night attacks no longer interfere with German detector apparatus which is now so sensitive that it is impervious to interference. German detection now is based on the scientific principle that rays emanating from the earth are reflected back when meeting an aircraft and can be caught and registered.

"In collaboration with the Air Ministry, new and improved devices have been worked out on this principle, which also allow distinction between enemy and friendly aircraft."

Preparing

FROM Norway it is reported that over 300 acres of forest have been felled to make room for the big airfield which the Germans are building at Haslemoen, Flisa, about 20 miles from the Swedish frontier. The work was started in January, and large areas have been evacuated and the forests cut down. Schools and churches have been requisitioned and farms devastated. The whole district has been practically destroyed.

Norwegians in the labour service have been conscripted for this work, in the teeth of the Hague Convention, which prohibits the employment of the people of an occupied country for the military purposes of an Occupying Power.

The airfield is situated only about 50 miles from the big German airfield at Gardermoen which the Germans have substantially enlarged.

Spotlights

DURING these weeks there has been no question of preventing all the breakthroughs of a greatly superior enemy in the East, but of strengthening ourselves for the decisive struggle in the West.—(*A provincial daily.*)

Do not ask the eternal question "Why?" It will not alter anything, for it is no magic wand before which war retreats.

Those who turn away from the war . . . those who do not consciously identify themselves with the war and who from weakness and fatigue do not wholeheartedly pledge themselves to it . . . help to prolong war, for somewhere their work is being missed, somewhere their lack of eagerness is holding things up.—(*From a German article.*)

A Dutchman arrested for listening to the B.B.C. was brought before a Nazi judge.

"What is your explanation?" asked the judge.

"Your honour," said the prisoner, "the Fuehrer said he would be in England by October, 1940. I have been listening-in ever since, for I would not want to miss the Fuehrer."

If . . . .

(*From a provincial German newspaper*)

"LET us not be blind to the fact that there are petty minds among us who display doubts and adhere to so-called objectivity even on the most trifling occasions.

"According to these people many things are said and written which will not be half so bad in reality; they think therefore that it would not be advisable to expect only evil from our enemies, since, after all, they are also human beings."

Deploring this lapse into liberalism, the article says that Germany's past experience "is enough to preclude all discussions on the question of how things would turn out if . . ."

* * *

The Civil Aviation Directorate (Hôtel Radio, Vichy) is headed by General d'Harcourt. The post of a Deputy Director of Civil Aviation has been abolished and its former holder, Vivent, now heads another service to be mentioned later. The Civil Aviation Directorate is divided into four Departments: Airways and Flying Personnel (Exploitation des Lignes Aériennes et Personnel Navigant), under Bastide; Personnel Accounts, Gliding and Scale-model Construction (Comptabilité du Personnel, Vol à Voile et Modèles Reduits), under Bandouin; finally, Flying Equipment and Airport Operations (Matériel Aéronautique and Exploitation des Aérodromes), both under Pacaud.

Subject: Hermann

A BERLIN rumour says that a group of *Luftwaffe* generals have asked Hitler to relieve Goering of his post as Commander-in-Chief of the German air force as he was not capable of directing air operations "under these difficult war conditions."

Comfort in the Avro Y

Photographs Jule
Show Differe sse
Versions

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MANY are the different functions which the Avro York can perform. Although the wings and engine installation are those of the Lancaster bomber, the York is in reality a separate type, the much larger fuselage and long nose, not to mention the high setting of the wing, distinguishing it clearly from its military ancestry.

Obviously there are numerous wartime uses for such an aircraft. Transport of people on urgent business, and freight of widely varying character from aircraft engines or spares to even more bulky military necessities, come to mind at once. Thus one cannot really speak of *the* York.

At one end of the scale we have the version specially furnished for the transport of very important persons; at the other the 100 per cent. freight version, in which the interior of the fuselage is strictly utilitarian. In between there is a somewhat more "ordinary" version capable of accommodating more than 50 passengers. Or, again, the layout may be arranged to carry a mixed load of passengers and freight or mails.

Power is provided, it may be recalled, by four Rolls-Royce Merlin XX liquid-cooled engines of 1,260 h.p. each, driving De Havilland three-bladed hydromatic fully feathering airscrews. The wing span is 102ft., the wing area 1,205 sq. ft., and the overall length 78ft. 6in.

4

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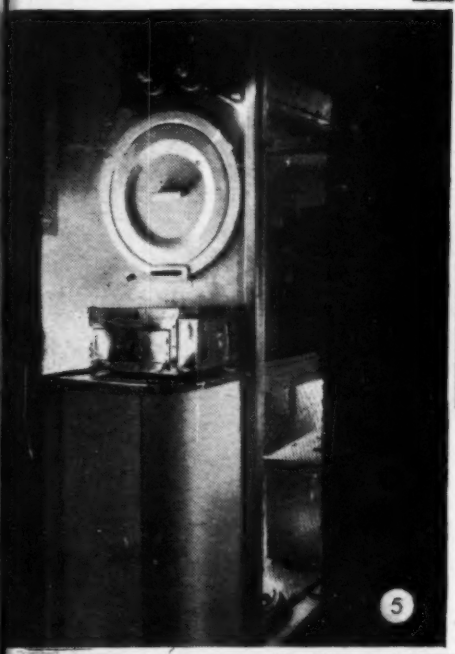
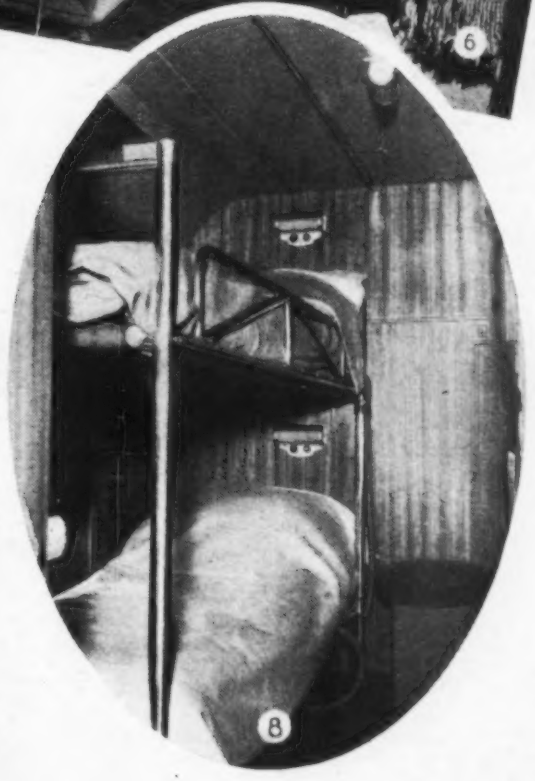
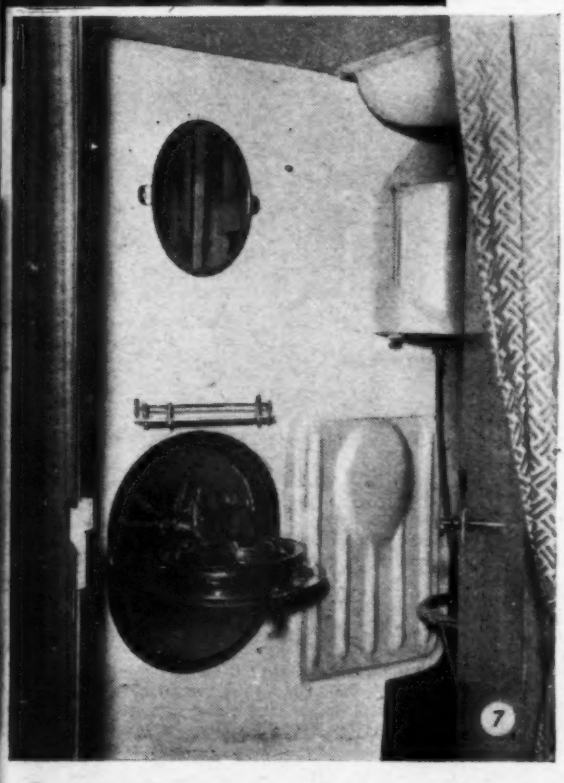


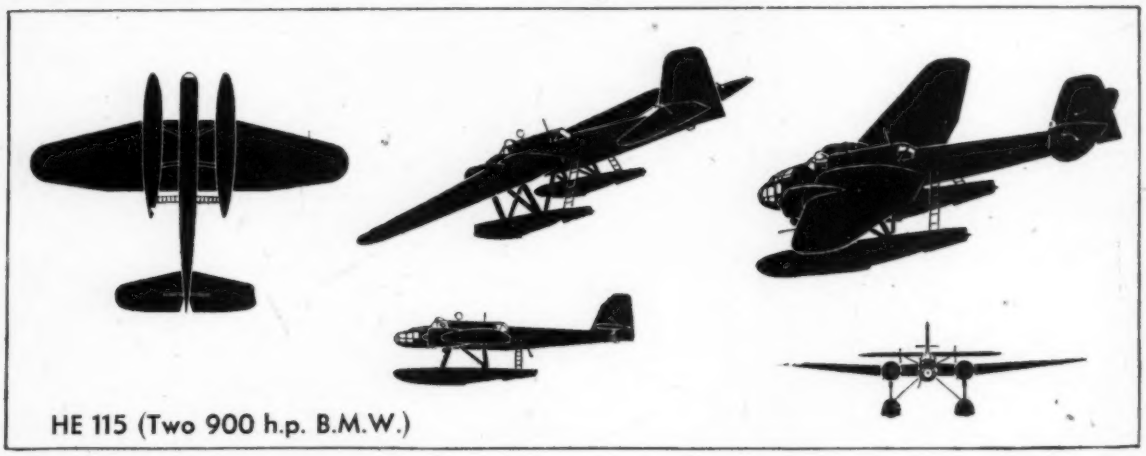




AVRO AMENITIES: 1, the York looks well streamlined in spite of its flat-sided fuselage 2 and 4, views inside. 3, a cosy corner in the cabin. 5, a corner of the kitchen, with electric cooker. 6, a cabin for "VIPs" (very important personages). 7, one of the lavatories, which are situated between front and rear cabins. 8, a two-berth stateroom.

Studies in Recognition

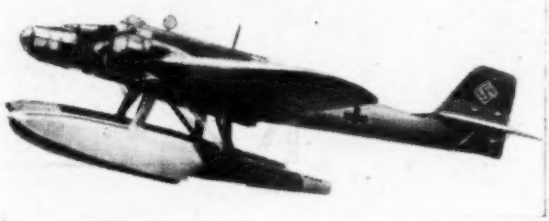
Aircraft in Flying Attitudes



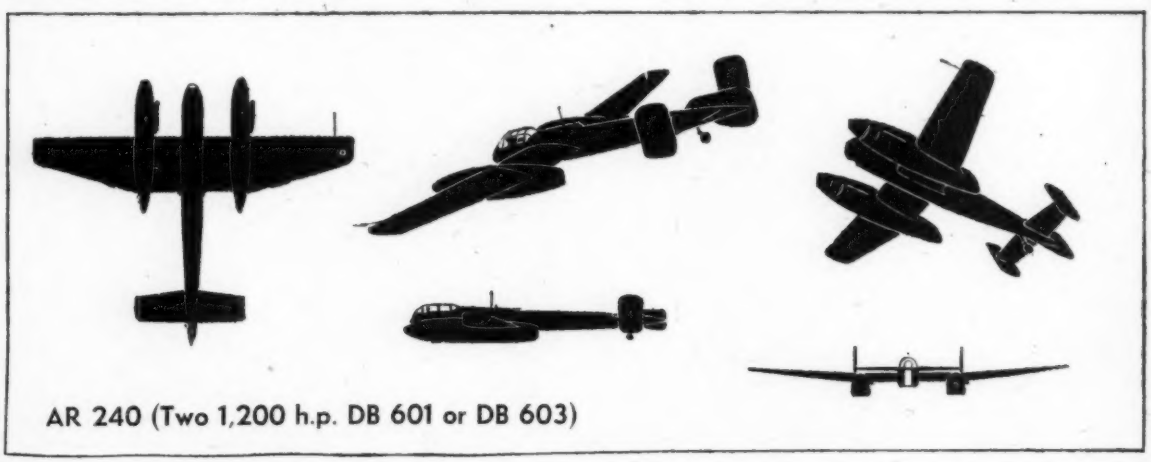
HE 115 (Two 900 h.p. B.M.W.)

MILITARY version of a civil type which set up a number of load/range records before the war, the Heinkel He 115 seaplane is employed for reconnaissance, torpedo-carrying and mine laying, operating chiefly over the North Sea. It is powered by a pair of 900 h.p. B.M.W. radial engines and has a top speed of 220 m.p.h. It has four m.g.s and one cannon.

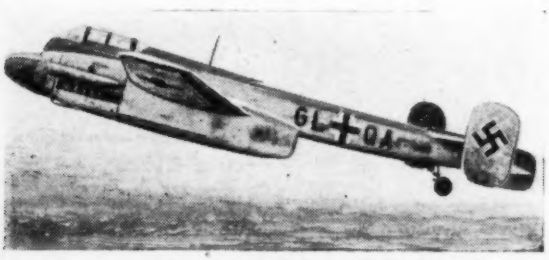
Of mid-wing design, it has a flat, rectangular centre-section tapering in thickness towards the nacelles, the leading edge of the outer panels being backswept with slight taper on the trailing edge. The strut-braced tailplane has similar taper and is mounted on the fin; both have round tips, but the vertical tail surfaces are square cut. Fuselage is oval and narrow, with raised glasshouse and glazed nose, and fixed ladders run from floats to fuselage. Dimensions: Span, 75ft. 9in.; length, 57ft.; height, 23ft. 4in.; wing area, 946 sq. ft.



Heinkel He 115 Reconnaissance Seaplane



AR 240 (Two 1,200 h.p. DB 601 or DB 603)



Arado Ar 240 Fighter-bomber.

AN approximate opposite number to the Mosquito, the Arado Ar 240 two-seater reconnaissance fighter-bomber makes a complete change from previous Arado designs. Powered by two 1,200 h.p. Mercedes-Benz DB 601 or DB 603 engines, it has a top speed of about 350 m.p.h. and carries an internally stowed bomb-load of some 2,000lb. A high-altitude reconnaissance version with a pressure cabin also exists experimentally.

Low mid-wings have a flat rectangular centre section, outer panels swept forward on trailing edge, and square tips. Tailplane tapers slightly on leading edge only and carries rectangular "endplate" fins and rudders. Extra stabilising fins are also mounted above and below the pointed tail of the fuselage. "Snake's head" fuselage is long and slim, and heavy underslung nacelles project ahead of nose and aft of trailing edge. Dimensions: Span, 49ft. 6in.; length, 39ft. 9in.

Wooden Blades

A Preview of Airscrew Requirements for Post-war Civil Air Transport

By L. G. FAIRHURST, A.M.I.Mech.E.

THERE is little doubt that airscrews as a means of aircraft propulsion will remain for a considerable period after the war, particularly on the type of aircraft envisaged for the civil air transport field.

Of the major requirements which civil airline operators will demand, the maximum possible pay-load will hold a prominent place. This requirement at once emphasises the necessity for the utmost care in reducing the weight of aircraft, engine and airscrew components to the minimum, commensurate with safety and reliability. This article is intended to deal solely with the possibilities of weight-saving on the airscrew, mainly by the use of compressed wooden blades against their alternative metal counterpart.

First, in case the important part which wooden blades have played during the present war and the rate of progress achieved in their use on military aircraft are not fully appreciated, a few remarks should be of interest.

Aircraft of such divergent types as the heavy bomber and the high-speed altitude fighter have been operated most successfully during the present war with airscrews fitted with compressed wooden blades. The performance has been proved equal in all cases to the metal counterpart, with the outstanding advantage of a big saving in weight.

Development has proceeded at a tremendous rate, and the outstanding ability of the wooden blade to absorb vibrations from engine harmonics has considerably enhanced its reputation, particularly since the vibration problems are a constant source of aggravation with ever-increasing engine power output.

The ease with which wooden blades can be repaired after damage in combat or forced landing has been shown to be of great value under wartime conditions with their problems of material supply. Further, the fact that wooden blades fracture readily in a crash landing makes possible a higher percentage of salvage of airscrew hub and engine reduction gear mechanism than is the case with the metal blade, due to the shock loads imposed by the latter on the hub and engine mechanism.

THE author of this article is chief engineer of Rotol, Ltd., and thus has had wide experience of metal airscrew blades as well as of the different wooden blades, such as the "Weybridge," Jablo and Hydulignum. For use on post-war commercial aircraft he strongly advocates wooden blades, chiefly because of the great saving in weight.

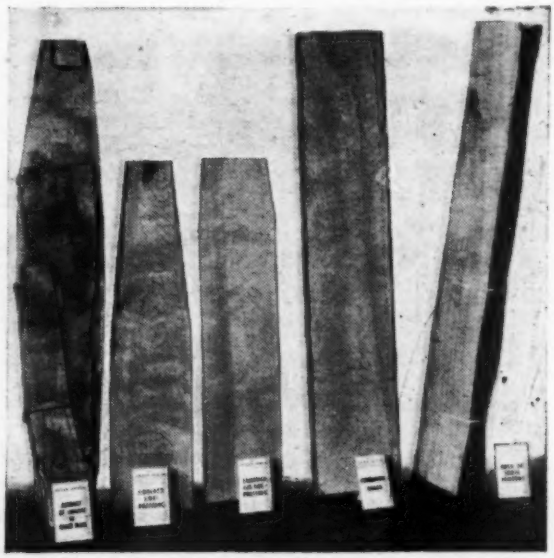
Compressed-wood Blade Construction

Before dealing with the main question of the weight-saving which can be contributed by the airscrew, the reader will no doubt appreciate a few notes on the construction of the compressed wooden blade. The blade is produced from profiled blocks, each block being built up by gluing together several rectangular-shaped boards approximately 0.800in. thick.

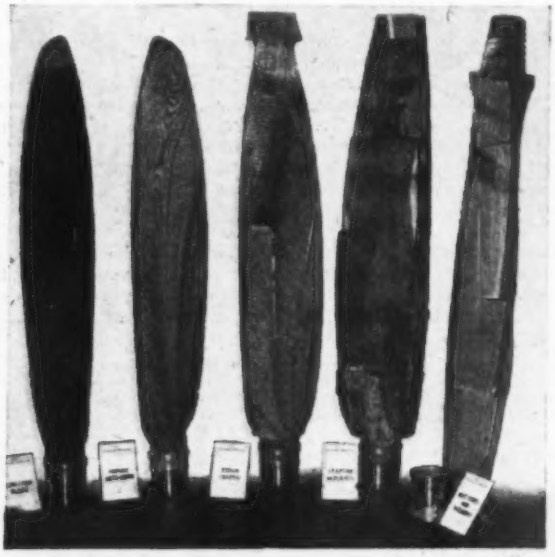
These boards are made by compressing in heated presses a pack of veneers, interspersed between each veneer being an agglutinant which can be either in the form of a resin coated on each veneer or an impregnated paper film.

In each case the application of heat and pressure consolidates the pack of veneers into a rectangular board of constant thickness. The arrangement of the veneers and the method of pressing is such that one end of the board has a density of 1.30, while the remainder (the greater length) has a density of 0.90. The blade aerofoil portion is machined from the 0.90 density portion and the root from the 1.3 portion, thereby ensuring that the root shall have adequate strength to withstand the stresses imposed by the centrifugal and bending loads from the blades.

During manufacture extreme care is taken to ensure a moisture content at which the blade will remain stable, so as to prevent any change in blade balance when exposed to the varying atmospheric conditions encoun-



Stages in the making of a Hydulignum wooden blade. From right to left: A pack of loose veneers; board consolidated by hot-pressing; board trimmed for side pressing; finished side pressing; finished assembly in glued block.



FINAL STAGES. From right to left: Finished assembly butt-ended and threaded; metal adaptor mounted; blade rough-shaped; finished white-shaped; blade finished and covered.

WOODEN BLADES

tered in service. The bare blade is then sealed with a surface-covering which prevents the ingress of moisture and also withstands erosion from stones, sand or hail.

Excellent and successful experience of this latter feature has been obtained during the present war by the operation of wooden-bladed airscrews in such varying theatres as Russia, the Middle East and the Far East.

The strength of the wooden blade has been developed to such a high degree that it is directly interchangeable on diameter with the metal blade. From this it is at once obvious that an airscrew designed for metal blades will show a considerable reduction in weight when fitted with wooden blades.

Types Classified

The main types of aircraft to be dealt with in this article come under the following headings:—

(*a*) *Twin - engine feeder - line machine.*—The twin-engined feeder airliner for linking up the different parts of Britain with the main air termini for transcontinental or transoceanic routes. Airscrew would be of either three- or four-bladed type, absorbing from 800-1,500 h.p. for take-off. A saving of 75 lb. per airscrew, equal on this type of aircraft to an additional passenger or the equivalent goods.

(*b*) *Four-engined airliner.*—The four-engined airliner of around 70,000 lb. weight developed from the successful heavy bomber types used during the present war and covering the five years' period immediately after the war. The airscrew would be of the four-bladed type, absorbing up to 2,400 h.p. for take-off. A saving of 110 lb. per airscrew, totalling 440 lb. on a complete installation.

(*c*) *Super airliner or seaplane.*—The super airliner of around 100 tons weight, either in landplane or seaplane form, to follow on from the type (*b*). The airscrew would be of the contra-rotating type, absorbing from 3,000 to 4,000 h.p. for take-off. A saving of 160 lb. per airscrew, giving a total depending upon the number of airscrews.

From these figures, it can be left to airline operators to assess the value of fitting airscrews of this type, but taking (*b*) above as an example, and employing a figure (which I understand was in fairly common use by airline operators prior to the war) of £10 per annum as additional revenue for every one pound of aircraft weight saved, it will be seen that by the use of airscrews of this type the advantage would be to add £4,400 per annum to the earning capacity of the machine.

Operational Life

Airscrew development and service experience of various forms of blade-covering during the present war have produced a surface which is as durable as that of the metal blade; and it has the added advantage of easier repair when operating under such stringent conditions as take-off on desert airfields and from water. This repair can be done without disturbing the aerofoil shape, thereby maintaining optimum efficiency throughout the life of the airscrew.

Development is constantly proceeding on further improved types of covering, all the time with the object of still further enhancing the durable qualities of this form of blade, as the life of the wooden blade is largely dependent upon the durability of the surface-covering.

The main features in the specification of an airscrew for post-war civil applications would include the well-tried constant speeding and feathering features, the latter having proved its worth on bomber aircraft during the war by reducing the drag on a "dead" engine and preventing the "churning up" of broken parts inside the engine by windmilling.

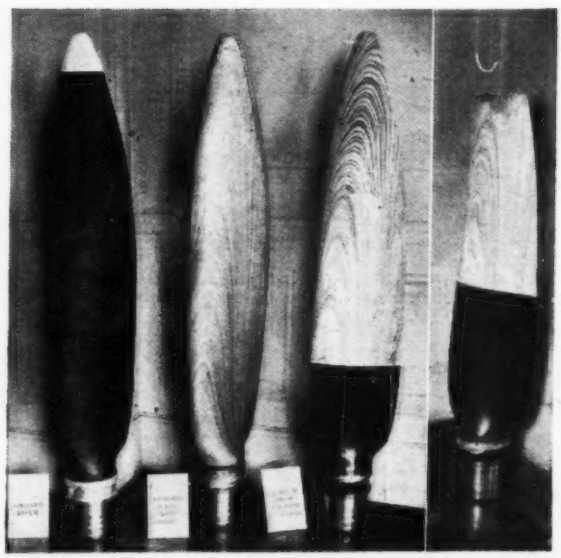
Reversible airscrews have still to be developed, but it is very evident that the latest multi-engined bombers require braking services additional to that provided by the wheel brakes. Airscrew braking is obtained by turning the blades into negative pitch after the landing wheels have "touched down" and reopening the engine throttles, thereby producing a negative thrust of considerable magnitude which shortens the landing run.

Synchronisation

Synchronisation of engines and airscrews, wherein each combination is automatically maintained at a predetermined engine speed, will also become an essential for civil air transport, thereby removing an unpleasant beat which would be present with engines running even slightly out-of-step.

It is clearly evident from the foregoing survey of airscrew design for civil air transport that among the various advantages held by the wooden blade the saving in weight stands out as a most attractive proposition to airline operators, and they would be well advised to consider seriously this feature in the interests of optimum economical operation of air transport, particularly in the heavier classes, which stand to benefit most.

A batch of Jablo blade blocks ready for shaping.



REPAIR OF WOODEN BLADES. From right to left: broken blade as received; new blade tip scarfed-on; repaired blade white-finished; finished repaired blade. Experience has shown that a blade tip scarfed-on is as strong as the original blade.

Aircraft Laminated Plastics

Development of Low-pressure Laminates : Fabric Fairings : Reinforced Floors for Transports

By W. NICHOLS, A.R.Ae.S.

CONSIDERABLE interest has been displayed by the aircraft industry both in this country and the U.S.A. in the development of non-structural components in laminated plastics, such as fairings, spinners, wing fillets, antennæ housings, ducts, and many other minor parts and accessories. Hitherto the manufacturing technique involved the use of both high pressure and high temperature. For some time past experiments have been taking place behind the scenes in the plastics industry to produce these and other components by the more convenient low-pressure method, thereby dispensing largely with high-pressure equipment and at the same time providing a better and more reliable bond and superior material.

The results of such experiments have for obvious reasons been regarded as confidential, but recently investigations carried out by the plastics laboratory of the General Electric Co., U.S.A., have been made known to the industry. During these investigations cotton fabric or paper sheets saturated with, it is important to note, specially prepared thermosetting resins and built up in layers, were laminated satisfactorily in rigid moulds at the low pressure of 250 lb./sq. in. and at temperatures ranging between 280 and 350 deg. F.

By using the inflated or vacuum-bag method in combination with steam pressure, satisfactory components have been produced with pressures as low as 60 lb./sq. in. Laminated material of paper or fabric has replaced wood in many directions in the American industry because of better formability and due to the fact that such laminates possess equal strength in all directions.

Low-pressure laminating with thermosetting resins

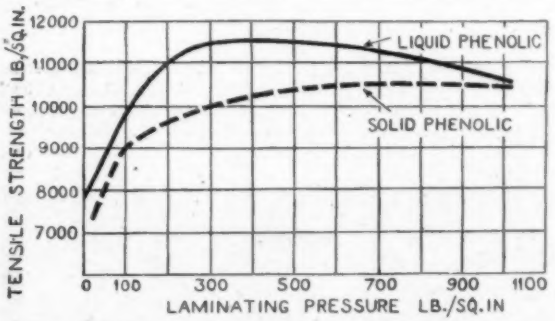


Fig. 1. Effect of laminating pressure on the tensile strengths of laminated cotton cloth-treated stock = 59-60 per cent. resin. Liquid and solid phenolic.

differs widely from that of high-pressure laminating and moulding, which is usually done with sheet stock impregnated with phenolics or ureas and allowed to dry to a relatively low volatile content, then compressed and bonded at pressures ranging from 1,000 to 2,000 lb./sq. in and temperatures of 130 to 150 deg. C. in the case of ureas and 150 to 165 deg. C. for phenolics.

On the contrary, in the case of low-pressure laminating where objects must be flexible enough for forming to shape before and during the operation, volatile contents of the material must be higher, and if hydraulic pressure is used it is usually less than 100 lb./sq. in., and in any case limited to 300 lb./sq. in. Curing temperatures may or may not be lower than those used for high-pressure moulding.

For low-pressure work new types of thermosetting resins have had to be developed to meet these requirements. A resin, to be suitable for low-pressure work, should be carried to the highest state of condensation possible without making it too viscous for working, so that a minimum of reaction products, such as water, etc., will have to be removed in the curing process by heat and mechanical pressure.

The resin must, in addition, be stable at low temperatures, but potentially convertible at raised temperatures,

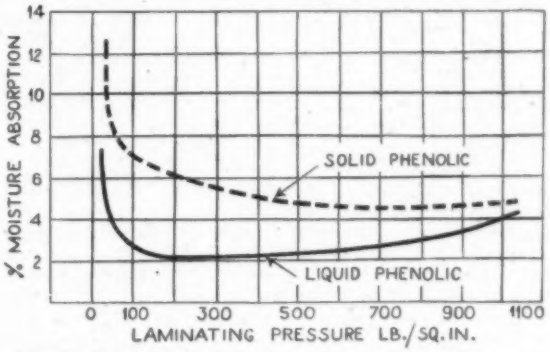


Fig. 2. Effect of laminating pressure on the moisture absorption of laminated cotton cloth. Treated stock = 59 to 62 per cent. liqu'd and solid phenolic.

for curing at moderate temperatures is often very desirable, especially so with fluid pressure through the medium of the rubber bag which high temperatures will eventually render useless. The usual way to provide for this is to accelerate the resin by adding highly acidic substances, but these can sometimes be destructive of the cellulose base of the laminated material. A series of resins have, however, been developed which become nearly neutral when cured, and the General Electric Co. have recently developed three such resins: (1) a highly condensed, nearly neutral, phenolic liquid resin which is very stable and mechanically strong in the cured state; (2) a phenolic solid-moulding compound having exceptional strength characteristics which was dissolved in alcohol to prepare it for treating the filler material; and (3) a more recently developed modified aminoplast resin which is catalytically accelerated during the curing process.

Treated stock, such as paper or fabric about to be formed into complex curvatures, must be very flexible and wet enough to form readily, but not so wet that the curing pressure squeezes out an excess of resin with a resulting poor bond.

Future Possibilities of Low-pressure Laminates

The General Electric Co. investigations reveal that bonding at low pressure so far is only fair at the best, and moisture absorption is likely to be high, hence enough resin must be present to impregnate the filler material thoroughly and to effect the best bonding. On the other hand, excess of resin will produce brittleness, and the type and quantity of resin to be used depends to a great extent upon strength requirements and desired resistance to moisture absorption of the finished component. In the experiments basic work was conducted with a standard cotton cloth having good strength and reasonable formability.

LAMINATED PLASTICS

Laminating pressures covered the range from 65 to 75 lb./sq. in. (at which most low-pressure laminating is now done), rising to 1,000 lb./sq .in., which may be taken as the beginning of the high-pressure range.

Results of tests show definite superiority of the liquid phenolic resin in tensile strength with the maximum resulting from 300 lb./sq. in. pressure. Further the effects on flexural strength and moisture absorption of the three resins used also point to the superiority of this particular resin. The conclusions arrived at are that low-pressure laminated material compares favourably with high-pressure laminates in mechanical properties and can be more conveniently used for forming complex shapes because of less distortion and rupture of the laminated fibres.

The investigators also believe that low-pressure laminates will be available in the near future which possess stability under wide temperature ranges, with adequate bearing strength, and having a tensile strength of 3,000 lb./sq. in. and a modulus of elasticity approaching 3,000,000 lb./sq. in. with, in addition, adequate resistance to vibration and moisture absorption. There is every reason to believe that these problems are now being solved by improvements in materials and design methods. The effect of laminating pressures on the tensile strength and moisture absorption for this material is shown by the curves in Fig. 1 and Fig. 2 respectively.

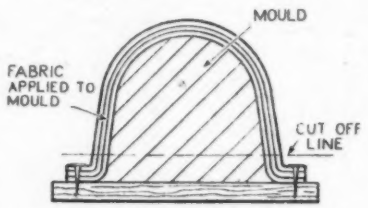


Fig. 3. Method of applying the fabric to the mould. No pressure is required, the fabric being stretched over the surface and held in place by wire brads or tacks.

Undoubtedly low-pressure laminated materials will be widely used in the future application of plastics to aircraft, but in an effort to speed-up American aircraft production the more conventional methods of moulding and shaping plastics with pressure have already been dispensed with for certain components. This method has apparently been successfully applied to the production of trainer aircraft only, for fairings and wing fillets, etc., and in view of the possibilities of a revival of the light aircraft industry after the war to which this process could apply by aiding economy in production, it is certainly worthy of consideration. These new cloth laminated units for non-structural parts are noteworthy in that little or no pressure is required for their formation, and for some materials no heat is needed. The moulds or forms required to provide basic shape are prepared from wood or plaster of paris, and in some cases an actual sheet metal or plywood fairing from earlier aircraft of the same type has served as the mould.

Economical Process for Non-structural Units

Representative examples of the method of applying the fabric about the mould are shown in Fig. 3, in which it will be observed no pressure is used, but the fabric is stretched very tightly over the surface and held in place by tacks or wire brads. To obtain a smooth surface, all wrinkles are stretched or, if necessary, "tailored" out and the edges temporarily held by tacks until the plastic adhesive permanently binds them together, when the next layer is applied and similarly treated.

The cloth laminates are built up from two elements: a cloth base and a plastic adhesive applied in solution form. Where compound curvatures are required a wide-open weave fabric is preferable, permitting stretching to the required shape, but for simple curvatures a canvas duck has sufficed. The attainment of a smooth outside surface has been achieved by finishing the laminated assembly with a smooth, thin, finely woven fabric, covering gaps in the coarse-weave under laminate and concealing surface irregularities.

The mould, it should be noted from Fig. 3, is made higher or deeper than the finished size of the component so that the cut-off line to required dimensions may be made cleanly and sharply, and not in too close proximity to the base of the form. As each succeeding layer is applied, the tacks may be reinserted to hold the fabric in place until it is hardened or stiffened on the addition of the plastic.

After the cloth laminate has been completed, usually without the assistance of heat or pressure, the surface is finished by applying two or three extra coats of the plastic, either by spraying or by brush, to the outside surface, which is then sanded-down after drying and the final coatings applied in the usual way.

It is important to note that with this class of laminated material, the plastic element does not necessarily penetrate the fibres, but surrounds them as a light film or a protective shield. As a result, if the ends of the fibre are exposed, water absorption may be substantially increased with subsequent instability in dimension; it is therefore essential that special attention be given to proper sealing of the edges.

The aircraft engineer should not overlook the fact that such laminated materials as reviewed above are not designed for anything other than non-structural components such as fairings or fillets, etc., etc. However, comparing typical cloth laminates prepared without heat or pressure, a tensile strength of 6,000 lb./sq. in. has been obtained with 45 per cent. ethyl cellulose (thermoplastic) resin.

Among the thermosetting resins which may be employed for this process are phenol formaldehyde, urea, or melamine formaldehyde, the cold-setting variety being preferred, but the application must occur soon after the liquid catalyst is mixed with the dry resin because they will set fairly rapidly at room temperature, and batches cannot be kept in store.

Representative applications have already been cited quoting the fillet for streamlining the regions between wing and fuselage and between horizontal and vertical tail surfaces. These could normally present complications due to the blending of several curvatures, but resin-bonded laminates can readily be built up to reproduce these curvatures very economically without the necessity of costly forming or drawing dies, etc. From experience gained with such components in America, it is claimed that the finished laminates will give satisfactory service possessing good weathering qualities and flexibility.

Plastics are gradually being used effectively in the con-

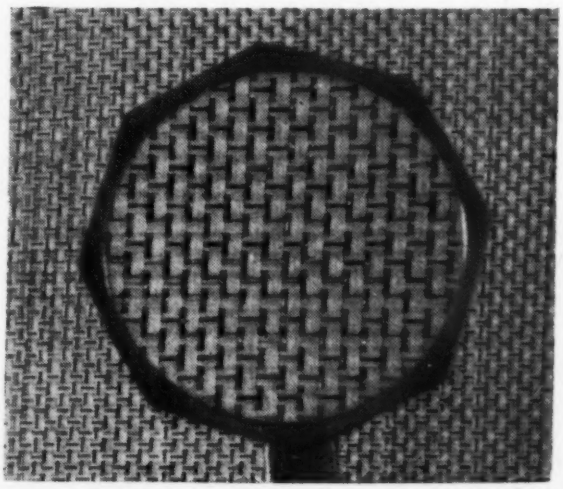


Fig. 4. A sample of unprocessed reinforcing material. Note the fine-gauge H.T. steel wire which is interwoven with the fabric on a power loom.

LAMINATED PLASTICS

struction of lightweight flooring for modern air transports, incorporating some form of reinforcement to give added strength. In this respect it is of interest to note that the Glenn Martin Company have adopted this type of lightweight flooring for the "Mars" built up of a laminated paper-base phenolic plastic reinforced with strips of aluminium alloy. Its use, it is claimed, represents a weight saving of 0.25 lb. per sq. ft. on the previous type of flooring used.

In this country an excellent material is now available for the reinforcing of laminated plastics, a photograph of an unprocessed sample being shown in Fig. 4. This material, which is being increasingly used in the engineering industry, is produced by Reinforced Plastics, Ltd., and is particularly well suited for the reinforcing of plastic or plywood floors for aircraft, resulting in added strength and a considerable reduction in weight per sq. ft. From the photograph it will be seen that this reinforcing agent is a constructed material of 24 high-tensile steel wires and cotton to the inch woven in both the warp and the weft, the selection and arrangement of the high-tensile steel wires varying according to the purpose required, but in any case so woven as to be interlocking. Ultimate tensile strength of this material, both longitudinally and transversely, is over 24,000 lb./sq. in., and it is of comparatively light weight, the specific gravity for one-ply steel wire-cotton embedded in laminated paper or fabric being 1.65, against, for example, 2.7 for aluminium spec. L.4 and 2.85 for duralumin spec. L.3. A further attraction over normally laminated materials is the very high impact figure of 16 ft./lb.

The minimum thickness is $\frac{1}{32}$in., but increased thickness and strength can be obtained by superimposing and consolidating any number of layer units, which, to approach an isotropic material with equal strength in all directions, can be arranged with the H.T. wires running at 45 deg. as well as 90 deg. The application of this reinforcing as the core of laminated materials has the added advantage of maintaining dimensional stability, for it is unaffected by the humidity of the atmosphere.

Lightweight flooring for aircraft of all types may be conveniently constructed with this reinforcement, either with a laminated paper material involving the use of high pressures and temperatures, or in some cases more conveniently in combination with wood veneers and a cold-setting adhesive. Some typical examples of a flooring using the latter process are illustrated in Fig. 5, in which (a) would be suitable for a trainer or light aircraft. This comprises one sheet of $\frac{1}{16}$in. thick birch veneer, to which the reinforcing material is attached by a cold-setting cement such as Beetle "A," already widely used and well known in the aircraft industry. A perfect bond between the reinforcing agent and the veneer has been produced in such an example using Beetle "A" cement with a pressure of approximately 2 lb./sq. in, which indicates how conveniently a floor of this description can be produced. As will be seen from the illustration, the floor is stiffened by light spruce members arranged at right angles and suitably spaced at approximately 18in. apart.

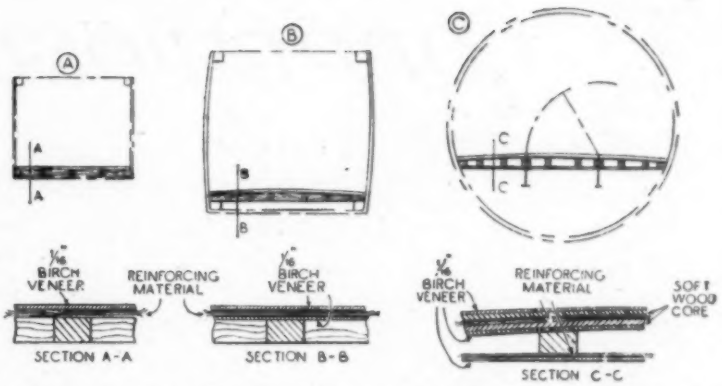


Fig. 5. Representative types of reinforced flooring: (a) light trainer; (b) feeder-line aircraft; (c) large transport aircraft. This type of construction is made possible by the introduction of a new reinforcing material and plastic adhesives.

In examples (b) and (c) a more robust design for a feeder-line aircraft and heavy transport respectively is depicted. It will be seen that the floor surface construction involves a three-ply and a multi-ply respectively with the reinforcing medium as the core in both cases. Applying the reinforcing material to plywood and multi-ply construction involves the press, and it has been found that the best results were obtained by impregnating the fabric with a solution such as two parts Bakelite 540 resin and one part methylated spirits for approximately five minutes, after which a pre-cure for a further five minutes at 85 deg. C. should be given prior to the final pressing operation being carried out at a temperature of 160 deg. C and a pressure of 500 lb./sq. in. Pressure and heat should be maintained for twenty minutes, and the platens allowed to cool before the pressure is removed. An example of reinforced multi-plywood is shown in Fig. 6 in which, it should be observed, soft wood veneers are used next to the reinforcing material which forms the core. By this means a superior bond is found to result, the tensile strength of such material being 27,000 lb./sq. in. in both directions.

In example (c) the floor panels are designed in the form of a box structure with light spruce stiffening members suitably spaced between the upper and lower skins, the latter being one sheet of wood veneer covered with the reinforcing material on the inside face. The upper surface would, of course, be manufactured by the hot-press process, whilst the lower panels could be manufactured by the cold process similar to example (a). Where this is employed, the setting time could be accelerated by low-temperature heating panels in contact with the surfaces.

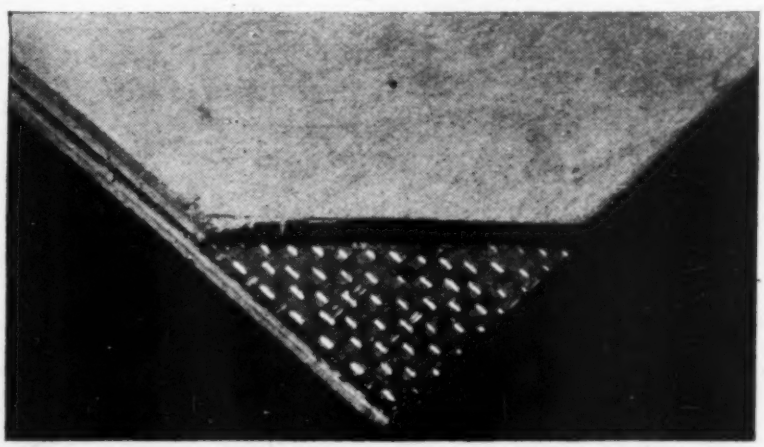


Fig. 6. Reinforced multi-plywood. Tensile strength is approximately 27,000 lb./sq. in. in both directions.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

PILOTLESS PLANES

A Better Name Wanted

WHY "Pilotless planes"? This expression does not fully describe the articles.

Surely this is the opportunity for the correct use of the term "Aerial Torpedo," so often misused in this war and the last. The parallel with the marine torpedo is exact.

NORMAN F. PHILLIPS.

[We are using this name in *Flight*.—ED.]

Some Technical Considerations

BY courtesy of the German High Command, I was last night able to obtain a view of their latest "infernal machine."

Having read several very erudite (?) descriptions in the lay Press, I am very interested in this weapon, which, according to Goebbels, is causing us great concern.

My first impression was, I must confess, one of awe; but, having recovered, I was struck by its low ceiling and speed. Under the assumption that it was propelled by jet reaction, the presence of an only partly combusted efflux points to a low thermal efficiency and an uneconomical expenditure of fuel.

From what I could see by unaided vision at dusk, it appears that the engine is not integral with the fuselage, but is attached to and above the stern frame* by three rigid members which no doubt contain the fuel lines.

One bright newspaper correspondent remarked upon its aerodynamic form, which he considers would evoke scientists' admiration. This I consider to be misplaced enthusiasm, as by nature of its intended purpose and method of propulsion the usual excrescences, namely, coolant and oil rads., cockpit covers, etc., are not required.

Secondly, as the engine is not integral with the fuselage, there will be an increased parasite drag; also, I should imagine that the wing loading is high.

I should, therefore, like to hear any constructive criticisms and comments which your readers may have regarding the foregoing.

KENNETH S. OTHICK.

AIRCRAFT ENGINEERING TRAINING

Post-war Rôle for R.A.F. Schools

THE plan of training accepted by the S.B.A.C. Committee might perhaps have been good for the slow-motion England of pre-war days, but it certainly is not for the dynamic British Empire of the years that will follow Victory.

Since the beginning of this Liberty War, under the pressure of necessity the Technical Command of the R.A.F. has evolved a magnificent system of trade training which is unfortunately almost unknown. More especially for the training of all grades of aircraft engineers from Flight Mechanic to Fitter I, the great engineering schools of the R.A.F., which are second to none, have developed methods of technical education (theoretical and practical) which would be a surprise for the technicians of the S.B.A.C. if they could study them. No private aircraft firm, not even among the most powerful and wealthy, and though it might be genuinely disinterested, could compete in apprentice training with the efficient and up-to-date schools which have been created by the R.A.F. and which are doing such a splendid job in the quick training of thousands of skilled engineers.

Of course, because of war necessities, this training is now short; it was a question of life and death for the British Empire to have a rapid and growing flow of skilled aircraft tradesmen. However, being myself a technician and deeply interested in the problems of apprenticeship, I can state frankly that a young Englishman with no previous training learns more in six months in one of the R.A.F. technical schools than he would have done in two years in a private firm before the war.

It is not yet possible to have all the apprentices of the nation trained in national schools in the way that doctors, barristers, dentists, and so on, are trained, but it is possible to have all aircraft engineers, nay, all the aeronautical skilled tradesmen, trained in R.A.F. schools. These vast schools, with their efficient equipment, up-to-date methods, their excellent and devoted instructors, could, after the war, train aircraft engineers in a way that it would not be possible for firms of the S.B.A.C. to do, because the resources and vision of the latter are inferior to those of the national schools. The S.B.A.C. is no more able to create a truly national apprenticeship training than private industry would be capable of running Oxford, Cambridge or any of the other Universities.

To sum up, in Great Britain all that is necessary for the complete training (theoretical, practical, physical and moral) of aircraft engineers exists and has been working satisfactorily since the beginning of the war. If the pedagogues of the S.B.A.C. try to create their own system, it will probably end by asking for State subsidies, and the result will certainly be a Rowlandsonian caricature of the great R.A.F. technical schools, some of which could be converted, at the end of the war without difficulty.

B. BERNARD.

* Confirmed since this letter was received.—Ed.

FIGHTERS IN FRANCE

The Heroic Air Component

UNDER the lower photograph on page 629 of *Flight* of June 15th you state that in 1939 there were six Hurricane squadrons in France acting as cover for the Advanced Air Striking Force. This statement caused me considerable pain, not only because it was incorrect, but because once again the Air Component of the British Expeditionary Force remains in the background.

The six squadrons of fighters were actually distributed thus:—

Air Component: Nos. 85, 87, 607 and 615.

Advanced Air Striking Force: Nos. 1 and 73.

The lack of publicity given to the Air Component is something I fail to understand, and I feel sure that many of your readers are even ignorant of its existence.

Apart from an excellent article published in *Flight* of April 3rd, 1941 all reference to the Royal Air Force in France during 1939-40 centres around the A.A.S.F., and, while I do not wish to belittle the many and gallant deeds of "Cobber" Kain and his fellow pilots, I have long wondered why the heroic Air Component has not been given the recognition it so richly deserves.

I look to *Flight* for action; it is not too late even now to relate the inspiring tale of that handful of young men who held the bridge alone when Hitler's military snowball started to roll on May 10th, 1940.

E. C. FERGUSON.

GUNPOWDER v. PETROL

Relative Gas Volumes Produced

ONE cannot permit the letter of Mr. A. R. Ogston in the June 8th edition of *Flight* to pass without protest. I beg to submit that the difference in the volumes of gas produced by equal weights of octane and Mr. Ogston's obsolescent gunpowder is not so great as he would have us believe.

In his first equation Mr. Ogston shows that 1 lb. of gunpowder produces 5.9 cu. ft. of gas at N.T.P., or, as I prefer it, 1 gm. produces 0.33 litre. In his second equation he purports to show that 1 lb of octane is responsible for the production of 200 cu. ft. of gas. In actual fact the equation shows that 228 grs. of octane exploded in 179 grm. molecules of air (or 119 × 22.4 litres) produces 128 grm. molecules (or 128 × 22.4 litres) of mixed gases. Thus the actual amount of propellant gas produced by 228 grms. of octane is 9 grm. molecules or 9 × 22.4 = 201.6 litres, and 1 grm. of octane produces 0.88 litre of gas. This means, of course, that the octane produces 2.66 times the volume of gas as does the same weight of gunpowder. If Charles' law were to be applied the difference would be considerably less. It is, however, doubtful practice to apply Charles' law where great variations in pressure are likely to be involved.

It is more than likely that modern organic gunpowders can show a considerably increased gas production over octane, and it appears to me that the objections to the use of gunpowder as a fuel are chiefly difficulties in (a) handling, (b) carburation or injection, (c) ignition or detonation, and economic objections.

R. DAVENPORT.

OFF ON "OPS.": A Fairy Barracuda being wheeled to the take-off point on one of our carriers.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Awards

Far East

THE KING has been graciously pleased to approve the following awards in recognition of conspicuous service in operations against the Japanese:—

C.B.E. (Mil.)

Air Comdre. A. H. COBBY, D.S.O., D.F.C., G.M., R.A.A.F.

Distinguished Service Order

Group Capt. R. F. M. GREEN, R.A.A.F.

O.B.E. (Mil.)

Wing Cdr. J. F. LAWSON, R.A.A.F.
Wing Cdr. B. R. PELLY, R.A.A.F.
Sqn. Ldr. J. A. CAMPBELL, R.A.A.F.
Act. Sqn. Ldr. W. A. BRADLEY, R.A.A.F.

M.B.E. (Mil.)

Flt. Lt. N. A. HODGES, R.A.A.F.
Flt. Lt. F. J. D. SYER, R.A.A.F.
F/O. N. E. FRASER, R.A.A.F.

Distinguished Flying Cross

Sqn. Ldr. A. J. CLELAND, R.A.A.F.
Sqn. Ldr. A. A. THOMSON, R.A.A.F.
Act. Sqn. Ldr. G. C. ATHERTON, R.A.A.F.
Act. Sqn. Ldr. B. E. BROWN, R.A.A.F.
Flt. Lt. J. S. AUSTIN, R.A.A.F. (since deceased).
Flt. Lt. R. A. DICKSON, R.A.A.F.
Flt. Lt. M. HELSHAM, R.A.A.F.
Flt Lt. D. M. HOLYMAN, R.A.A.F.
Flt. Lt. R. L. LEWIS, R.A.A.F.
Flt. Lt. J. K. MCCARTHY, A.F.M., R.A.A.F.
Flt. Lt. H. D. MACKENZIE, R.A.A.F.
Flt. Lt. C. S. WALSH, R.A.A.F.
Act. Flt. Lt. S. MCK. CLARK, R.A.A.F.
F/O. S. R. CARTER, R.A.A.F.
F/O. A. F. CATT, R.A.A.F.
F/O. J. B. LEMCKE, R.A.A.F.
F/O. A. A. MACKAY, R.A.A.F.
F/O. G. R. MAUGHER, R.A.A.F.
P/O. R. S. HARBER, R.A.A.F.

George Medal

Flt. Sgt. T. H. DENNIS, R.A.A.F.
L.A/C. A. C. MCALISTER, R.A.A.F.

Distinguished Flying Medal

Flt. Sgt. (now F/O.) E. C. CLARK, R.A.A.F.
Flt. Sgt. R. S. JORDAN, R.A.A.F.
Flt. Sgt. L. A. LANGDON, R.A.A.F.

B.E.M. (Mil.)

Sgt. E. G. ARNDT, R.A.A.F.
L.A/C. W. P. THOMAS, R.A.A.F.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Act. Sqn. Ldr. C. F. WESTERMAN, D.F.C., R.C.A.F., No. 105 Sqn.—As navigator, this officer has completed a very large number of sorties, most of them demanding a high degree of skill and resolution. He has displayed exceptional keenness and devotion to duty and his ability to guide his pilot to the target without fail has contributed in a large way to the successes obtained. He has also devoted much time and care to the training of other members of the squadron with excellent results. He has set a very fine example to all.

Act. Flt. Lt. A. PEARSON, D.F.C., R.A.F.V.R., No. 7 Sqn.—This officer has completed a very large number of sorties and has continued to set the highest standard of skill and bravery. He has taken part in all the squadron's recent attacks on most heavily defended targets in Germany and has fulfilled his wireless duties with exceptional ability. His record is worthy of the greatest praise.

Act. Sqn. Ldr. J. L. MUNRO, D.F.C., R.N.Z.A.F., No. 617 Sqn.—Since being awarded the D.F.C. this officer has completed very many sorties, involving attacks on well-defended targets. He has displayed unfailing devotion to duty throughout and his example of gallantry and leadership has inspired all. On many occasions his aircraft has been damaged by enemy action but in every instance Sqn. Ldr. Munro has flown safely to base. His achievements have been worthy of the greatest praise.

Bar to Distinguished Flying Cross

Act. Flt. Lt. C. K. ASTBURY, D.F.C., R.A.A.F.

F/O. J. McIntosh leaving Buckingham Palace after receiving the D.F.C., and Bar.

No. 617 Sqn.—As air bomber this officer has participated in very many sorties since being awarded the D.F.C., and continued to set the highest standard of gallantry and devotion to duty. On many occasions his aircraft has been subjected to fierce fire from the ground defences. Nevertheless, Flt. Lt. Astbury has executed his task with great coolness, and his accurate bombing has played a good part in the success of many sorties. He has rendered much valuable service.

Act. Flt. Lt. J. A. SEARS, D.F.C., R.A.A.F., No. 619 Sqn.—Now on his second tour of operational duty and since being awarded the D.F.C. this officer has completed operational sorties against some of the enemy's most important and heavily defended targets. Flt. Lt. Sears has continued to display keenness and determination of the highest order. He has set an excellent example and by his untiring efforts has done much to improve the standard of navigation in his squadron.

Sqn. Ldr. A. LAMBERT, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Since being awarded the D.F.C., this officer has taken part in a further number of operational sorties. An outstanding navigator and flight commander, Sqn. Ldr. Lambert has continued to display keenness, efficiency and great devotion to duty, setting a splendid example to all in his squadron.

Act. Flt. Lt. P. WILBY, D.F.C., R.C.A.F., No. 7 Sqn.—Since being awarded the D.F.C., this officer has continued to operate with unremitting zeal and enthusiasm. He has taken part in recent attacks on Berlin, Mannheim and Cologne, frequently making three or four runs over the target to make sure of the aiming point, in the face of the fiercest opposition.

Distinguished Flying Cross

Wing Cdr. D. M. H. CRAVEN, R.A.F., No. 12 Sqn.
Wing Cdr. S. J. MARCHBANK, R.A.F., No. 102 Sqn.
Act. Wing Cdr. J. C. MACGOWN, R.A.F.V.R.
Act. Wing Cdr. J. NORTHROP, A.F.C., R.A.F., No. 83 Sqn.
Sqn. Ldr. F. G. B. REID, R.A.F.O., No. 514 Sqn.
Act. Sqn. Ldr. E. J. SAUNDERSON, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. R. H. W. CLARKSON, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. R. S. PERRY, R.A.F.V.R., No. 139 Sqn.
Flt. Lt. E. G. STOKES, R.A.F.V.R., No. 139 Sqn.
Act. Flt. Lt. G. BAXTER, R.A.F.V.R., No. 83 Sqn.
Act. Flt. Lt. W. E. D. BELL, R.A.F.V.R., No. 619 Sqn.
Act. Flt. Lt. F. V. GATESMAN, R.A.F.V.R., No. 83 Sqn.
Act. Flt. Lt. E. C. HOMER, R.A.F.V.R., No. 77 Sqn.
Act. Flt. Lt. J. H. STALLWOOD LEE, R.A.F.V.R., No. 106 Sqn.
Act. Flt. Lt. R. E. MANVELL, D.F.M., R.A.F., No. 156 Sqn.
Act. Flt. Lt. G. H. NICHOLSON, R.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. J. N. POLLOCK, R.A.F.V.R., No. 514 Sqn.
Act. Flt. Lt. G. H. R. POLSON, D.F.M., R.A.F.V.R., No. 97 Sqn.
Act. Flt. Lt. N. F. TURNER, D.F.M., R.A.F.V.R., No. 61 Sqn.
Act. Flt. Lt. J. R. VALENTINE, R.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. J. ANDREW, R.A.F.V.R., No. 78 Sqn.

SERVICE AVIATION

F/O. G. W. BRAKE, R.A.F.V.R., No. 630 Sqn.
F/O. H. R. BUTLER, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
F/O. P. DAVIS, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
F/O. L. DURHAM, R.A.F.V.R., No. 50 Sqn.
F/O. J. W. DYMOCK, R.A.F.V.R., No. 78 Sqn.
F/O. A. W. FORBES, R.A.F.V.R., No. 51 Sqn.
F/O. R. FRAZER, R.A.F., No. 83 Sqn.
F/O. S. GIBBON, R.A.F.V.R., No. 51 Sqn.
F/O. D. F. GILLAM, R.A.F.V.R., No. 100 Sqn.
F/O. E. H. W. HARRISON, R.A.F.V.R., No. 622 Sqn.
F/O. P. E. T. JONES, R.A.F.V.R., No. 51 Sqn.
F/O. J. F. G. LANE, R.A.F.V.R., No. 158 Sqn.
F/O. J. W. LOWRIE, R.A.F.V.R., No. 103 Sqn.
F/O. H. L. MORGAN, R.A.F.V.R., No. 138 Sqn.
F/O. J. H. O'NEILL, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
F/O. D. P. L. O'NEIL-SHAW, R.A.F.V.R., No. 103 Sqn.
F/O. C. PHILIPSON-STOW, R.A.F.V.R., No. 7 Sqn.
F/O. J. A. PRIOR, R.A.F.V.R., No. 9 Sqn.
F/O. P. J. RICHARDS, R.A.F.V.R., No. 106 Sqn.
F/O. J. D. STENT, R.A.F.V.R., No. 166 Sqn.
F/O. H. L. VICKERSTAFFE, R.A.F.V.R., No. 619 Sqn.
F/O. A. C. WARNOCK, R.A.F.V.R., No. 78 Sqn.
P/O. J. R. BAKER, R.A.F.V.R., No. 432 (R.C.A.F.) Sqn.
P/O. T. W. BLACK, R.A.F.V.R., No. 44 Sqn.
P/O. V. E. BOWDEN, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
P/O. J. BURNS, R.A.F.V.R., No. 102 Sqn.
P/O. R. G. CAMPBELL, R.A.F.V.R., No. 207 Sqn.
P/O. R. M. CHILLINGWORTH, R.A.F.V.R., No. 149 Sqn.
P/O. A. G. CLARKE, R.A.F.V.R., No. 149 Sqn.
P/O. W. A. GALL, R.A.F.V.R., No. 9 Sqn.
P/O. H. D. GILLIS, R.A.F.V.R., No. 156 Sqn.
P/O. R. HAMBY, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
P/O. W. H. HIGGS, R.A.F.V.R., No. 51 Sqn.
P/O. M. C. HEARSUM, R.A.F.V.R., No. 78 Sqn.
P/O. G. E. A. HUDSON, R.A.F.V.R., No. 76 Sqn.
P/O. R. T. HUGHES, R.A.F.V.R., No. 630 Sqn.
P/O. A. KELL, R.A.F.V.R., No. 51 Sqn.
P/O. C. G. W. KENYON, R.A.F.V.R., No. 550 Sqn.
P/O. G. N. KNOWLES, R.A.F.V.R., No. 149 Sqn.
P/O. A. B. MACMILLAN, R.A.F.V.R., No. 78 Sqn.
P/O. C. H. MATTHEWMAN, R.A.F.V.R., No. 109 Sqn.
P/O. P. W. MOORE, R.A.F.V.R., No. 626 Sqn.
P/O. D. I. PALMER, R.A.F.V.R., No. 432 (R.C.A.F.) Sqn.
P/O. B. E. PATRICK, R.A.F.V.R., No. 109 Sqn.
P/O. H. PETERS, R.A.F., No. 78 Sqn.
P/O. W. F. POSSEE, R.A.F., No. 9 Sqn.
P/O. J. V. REDDISH, R.A.F.V.R., No. 49 Sqn.
P/O. J. C. ROBB, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
P/O. B. G. L. ROGERS, R.A.F.V.R., No. 9 Sqn.
P/O. K. R. ROGERS, R.A.F.V.R., No. 100 Sqn.
P/O. J. SAGE, R.A.F.V.R., No. 7 Sqn.
P/O. H. F. SIBLEY, R.A.F.V.R., No. 51 Sqn.
P/O. J. STOKES, R.A.F.V.R., No. 138 Sqn.
P/O. G. H. TAYLOR, R.A.F.V.R., No. 78 Sqn.
P/O. D. E. TREVETHICK, R.A.F.V.R., No. 61 Sqn.
P/O. G. W. A. WHITE, R.A.F.V.R., No. 78 Sqn.
W/O. K. GIBBS, R.A.F.V.R., No. 156 Sqn.
W/O. B. L. GREGORY, R.A.F.V.R., No. 138 Sqn.
W/O. R. SOUTHERN, R.A.F.V.R., No. 90 Sqn.
Act. Sqn. Ldr. G. D. GRAHAM, R.A.A.F., No. 550 Sqn.
Act. Sqn. Ldr. D. P. S. SMITH, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Flt. Lt. A. B. CRAIG, R.A.A.F., No. 550 Sqn.
Act. Flt. Lt. E. S. LUDBROOK, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. F. MORRIS, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
F/O. K. R. BROOK, R.A.A.F., No. 578 Sqn.
F/O. R. A. CURTIS, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. E. H. FREEMAN, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. M. F. MANNING, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. J. W. MOORE, D.F.M., R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. A. M. SANDERS, D.F.M., R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. A. F. STUDDERS, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. K. C. BISHOP, R.A.A.F., No. 625 Sqn.
P/O. A. R. T. BOYS, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
P/O. F. BURBIDGE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. J. M. CUNNINGHAM, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. G. G. HAMMOND, R.A.A.F., No. 115 Sqn.
P/O. R. F. MILGATE, R.A.A.F., No. 115 Sqn.
P/O. C. ROANTREE, R.A.A.F., No. 49 Sqn.
P/O. R. J. SEXTON, R.A.A.F., No. 7 Sqn.
W/O. H. C. CHANDLER, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Flt. Lt. I. O. BRECKON, R.N.Z.A.F., No. 109 Sqn.
F/O. H. J. PLANK, R.N.Z.A.F., No. 102 Sqn.
P/O. M. S. ROBERTS, R.N.Z.A.F., No. 640 Sqn.
P/O. R. D. MILNE, R.N.Z.A.F., No. 405 (R.C.A.F.) Sqn.
Act. Flt. Lt. D. B. KING, D.F.M., R.C.A.F., No. 7 Sqn.
Act. Flt. Lt. I. L. MACKINNON, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Act. Flt. Lt. W. S. MIDDLEMISS, R.C.A.F., No. 625 Sqn.
Act. Flt. Lt. N. J. SMITH, R.C.A.F., No. 97 Sqn.
Act. Flt. Lt. J. G. THOMPSON, R.C.A.F., No. 619 Sqn.

Distinguished Flying Medal

Flt. Sgt. P. M. ASHPITEL, R.A.F.V.R., No. 514 Sqn.
Flt. Sgt. A. J. BAKER, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. D. BARKER, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. R. W. BERDINNER, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. R. S. BROWN, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. J. CLARK, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. J. M. CAMPBELL, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. P. A. DEACON, R.A.F.V.R., No. 44 Sqn.
Flt. Sgt. W. J. H. EDWARDS, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. R. G. EVEREST, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. J. A. FEATHERSTONE, R.A.F.V.R., No. 619 Sqn.
Flt. Sgt. L. E. FLOOD, R.A.F.V.R., No. 78 Sqn.
Flt. Sgt. (now P/O.) K. R. HURREY, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. L. HUXLEY, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. R. T. ISAAC, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. J. LEVER, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. K. D. LEWIS, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. (now P/O.) R. H. MCFERRAN, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. T. J. H. MCLEOD, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. A. L. PAILING, R.A.F.V.R., No. 640 Sqn.
Flt. Sgt. E. D. PRATT, R.A.F.V.R., No. 44 Sqn.
Flt. Sgt. S. E. PURSGLOVE, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. G. SIVELL, R.A.F.V.R., No. 138 Sqn.
Flt. Sgt. T. C. WALLER, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. W. J. WILKINSON, R.A.F., No. 9 Sqn.
Flt. Sgt. L. WOLF, R.A.F.V.R., No. 51 Sqn.
Act. Flt. Sgt. G. H. CLEMENTS, R.A.F., No. 156 Sqn.
Act. Flt. Sgt. A. E. J. HUTLEY, R.A.F.V.R., No. 35 Sqn.
Sgt. F. A. ATTWOOD, R.A.F.V.R., No. 12 Sqn.
Sgt. J. L. BOOTH, R.A.F.V.R., No. 51 Sqn.
Sgt. A. W. BURNETT, R.A.F.V.R., No. 51 Sqn.
Sgt. J. H. DUFF, R.A.F.V.R., No. 78 Sqn.
Sgt. P. J. DROUGHT, R.A.F.V.R., No. 101 Sqn.
Sgt. R. ELLIOTT, R.A.F.V.R., No. 51 Sqn.
Sgt. F. H. HAZEL, R.A.F.V.R., No. 207 Sqn.
Sgt. W. A. LEE, R.A.F.V.R., No. 61 Sqn.
Sgt. L. W. LEY, R.A.F.V.R., No. 101 Sqn.
Sgt. D. E. LEYSHON, R.A.F., No. 9 Sqn.
Sgt. D. C. MARK, R.A.F.V.R., No. 207 Sqn.
Sgt. G. MCFADDEN, R.A.F., No. 51 Sqn.
Sgt. G. F. POTTS, R.A.F.V.R., No. 101 Sqn.
Sgt. G. F. SMITH, R.A.F.V.R., No. 101 Sqn.
Sgt. L. H. J. WISE, R.A.F.V.R., No. 103 Sqn.
Flt. Sgt. R. A. CARR, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. J. C. THOMSON, R.A.A.F., No. 51 Squ.

THE KING has been graciously pleased to approve the following awards:—

Distinguished Service Order

Act. Wing Cdr. R. D. GEORGE, O.B.E., R.A.F.V.R.—Wing Cdr. George, the senior movements staff officer, was responsible for the smooth and efficient working of the supply system from the beaches to the airfields during the assault landing at Salerno. He landed with the first assault troops on the beaches in the early morning of September 10th, 1943. Thereafter, he was under fire, both on the beaches and whilst travelling between the various supply dumps and airfields, until the enemy had been forced to retreat sufficiently to allow the airfields to be occupied by units of the Tactical Air Force. Wing Cdr. George was wounded when his tented camp was hit by two enemy bombs; he did not, however, allow this to interfere with his personal supervision of the work of unloading and distributing the urgently required supplies. Throughout the operation Wing Cdr. George displayed great gallantry, and his example and coolness whilst under fire were an inspiration to those under his command, and contributed largely to the success of the operation.

O.B.E. (Mil.)

Act. Wing Cdr. D. J. SCOTT, D.S.O., D.F.C., R.N.Z.A.F.—In January, 1944, a Spitfire aircraft, which had been damaged by enemy action, crashed on an airfield and burst into flames. Wing Cdr. Scott, the Station Commander, immediately proceeded to the scene and ran straight to the cockpit, which was burning fiercely, to rescue the pilot, who was severely injured with his clothing on fire. Despite the intense heat of the conflagration and exploding ammunition, Wing Cdr. Scott, after considerable difficulty, succeeded in extricating the pilot and carried him to a safe distance from the fire. Unfortunately the rescued airman died later. Wing Cdr. Scott displayed great gallantry and a complete disregard of his own safety. During the incident he sustained burns to his face and hands which would have been severe were it not for the foam which was sprayed over him from the fire tender.

Act. Sqn. Ldr. W. R. PETTIT, D.F.C., R.C.A.F., No 199 Sqn.—One night in February, 1944, Sqn. Ldr. Pettit was the officer in charge of night flying at a R.A.F. station when an aircraft, whilst attempting an emergency landing, overshot the end of the runway and overturned. The aircraft immediately caught fire. Sqn. Ldr. Pettit rushed to the spot, and, with the assistance of the fire party, led by L.A/C. Wray, quickly released two members of the crew who had been trapped in the fuselage. Sqn. Ldr. Pettit then found that the rear gunner was seriously injured and trapped upside down in his turret. By this time the aircraft was burning furiously, and the petrol tanks had started to explode. In spite of this and of the further danger from exploding ammunition and pyrotechnics, Sqn. Ldr. Pettit decided to attempt the extremely difficult task of removing the rear turret completely from the fuselage, as all other attempts to reach the trapped gunner had failed. By strenuous efforts he was ultimately able to get into the turret while a party, headed by L.A/C. Wray, wrenched at it from outside. Eventually the gunner was extricated alive and without any addition to the severe injuries which he had sustained in the crash. Sqn. Ldr. Pettit's coolness, courage and initiative and L.A/C. Wray's determination and devotion to duty in dangerous circumstances were of a very high order, and were instrumental in saving the lives of three members of the crew of the aircraft.

M.B.E. (Mil.)

Flt. Lt. F. E. A. QUINN, R.A.F.V.R., No. 252 Sqn.—On December 13th, 1943, Flt. Lt. Quinn was the navigator of a Beaufighter aircraft which crashed when taking off; one member of the crew sustained injuries which rendered him helpless.

OVER THERE: Air Chief Marshal Sir Arthur Tedder and Admiral Sir Bertram Ramsay watching Allied aircraft which keep up constant air cover for our ground forces.

Flt. Lt. Quinn, although dazed and severely burned on his hands, shoulders and arms, managed to extricate himself from the blazing aircraft. Ignoring his injuries and the danger from the possible explosion of the petrol tanks and cannon shells, Flt. Lt. Quinn rushed back into the flames in an endeavour to assist his companion. This gallant action resulted in the saving of the airman's life. Flt. Lt. Quinn displayed similar gallantry on November 7th, 1943. On this occasion his aircraft crashed and was burning fiercely. Flt. Lt. Quinn, although suffering from shock and lacerations to his face, gave assistance to the pilot, who had been trapped.

F/O. C. EDDY, R.N.Z.A.F., No. 75 (N.Z.) Sqn.—One night in July, 1943, this officer was the pilot and captain of an aircraft which crashed when attempting an emergency landing, and burst into flames immediately. He received concussion and injuries to his scalp and spine. Despite his injuries, F/O. Eddy remained in the aircraft and assisted the bomb aimer from the overturned second pilot's seat. After getting clear of the aircraft, F/O. Eddy, on learning that one member of the crew was absent, re-entered the blazing wreckage and assisted a medical officer in a vain attempt to extricate the mid-upper gunner, who was trapped in his turret. It was not until the heat, fumes and smoke had made a continuance of rescue work impossible that F/O. Eddy was persuaded to abandon his efforts. His face was scorched whilst he was attempting to rescue the gunner, and he collapsed immediately after finally leaving the aircraft. F/O. Eddy showed gallantry in dangerous circumstances, and his unselfishness was instrumental in saving the bomb aimer's life.

George Medal

F/O. J. M. GALBRAITH, R.A.F.V.R., and Flt. Sgt. N. D. FORBES, R.A.F., both of No. 502 Sqn.—In January, 1944, this officer and airman were the pilot and flight engineer respectively of an aircraft which stalled and caught fire when attempting to land on return from an operational sortie. Although suffering from shock, cuts and bruises, they both managed to get out of the wreckage. Realising that three members of the crew were missing, they immediately re-entered the burning aircraft, which was carrying a full load of bombs, in an endeavour to rescue their comrades. Flt. Sgt. Forbes located the rear gunner, who had sustained injuries, and whose clothing was alight. After beating out the flames he assisted the gunner clear of the wreckage then to safety. F/O. Galbraith found the navigator unconscious and lying in the wreckage of the nose of the aircraft. Assisted by Flt. Sgt. Forbes, who had again returned to the aircraft, F/O. Galbraith freed the navigator and then passed him to another member of the crew, who had been able to extricate himself when the crash occurred. One member of the crew still remained in the blazing wreckage. Flt. Sgt. Forbes seized a fire extinguisher and managed to subdue and control the flames sufficiently to enable F/O. Galbraith to enter and search the tail of the aircraft. Unfortunately the remaining member of the crew was dead when found. F/O. Galbraith, although severely wounded on the chin, displayed high qualities of leadership, courage and unselfish heroism. Flt. Sgt. Forbes also showed great bravery in circumstances of considerable danger.

Sgt. C. CANNAN, R.A.F.V.R.—This airman, who is employed in the Fire Section, has shown exceptional fortitude when performing exacting and dangerous work attending crashed aircraft. On a recent occasion he took charge of the crash tender when a Halifax aircraft, carrying one large H.E. bomb, failed to gain height when taking off and crashed in a ploughed field outside the airfield boundary. The bomb did not detonate on the impact, but the aircraft burst into flames. The crash tender quickly reached the scene, followed by the ambulance. Three of the crew of seven had been thrown clear and were safe. Incendiary bombs started to detonate, but Sgt. Cannan and two other airmen went into the fire area and helped to safety two of the crew who were trying to extricate themselves. Flames on their clothing were extinguished, and the two rescued airmen were handed over to the staff of the ambulance. As one of the crew was still missing Sgt. Cannan returned to search the wreckage. Eventually he found the pilot, who had been thrown out of the bomber, partially hidden in a furrow in the field. He was stunned, and Sgt. Cannan carried him 20 yards from the fire, where he was assisted by a medical orderly. Sgt. Cannan displayed great courage, working in the full knowledge that a major explosion from the bombs might occur at any moment.

B.E.M. (Mil.)

L.A/C. J. T. WRAY, R.A.F.—For citation see Act. Sqn. Ldr. PETTIT, O.B.E., D.F.C.

Flt. Sgt. R. A. LINDSAY, R.N.Z.A.F., No. 51 Sqn.—One night in December, 1943, Flt. Sgt. Lindsay was the navigator of an aircraft which crashed and caught fire when landing at base after an attack on Berlin. He was thrown 60 feet in front of the aircraft, and, besides receiving severe burns to his face, sustained a broken arm and a broken ankle. Nevertheless his first thoughts were for his companions who were still in the burning aircraft. Despite his great pain, and in the face of fierce flames, this airman dragged himself back to the wreckage. Without hesitation, he then braved the intense heat and blazing petrol and aided the trapped and badly injured bomb aimer and flight engineer to a place of safety. Even after the arrival of the ambulance Flt. Sgt. Lindsay disdained treatment until his injured companions had been cared for. He displayed high courage and unselfish devotion to duty.

Sgt. E. ROBERTS, R.A.F.V.R., No. 90 Sqn.—One night in February, 1944, Sgt. Roberts was the mid-upper gunner of an aircraft which crashed and burst into flames when reaching base after an operational flight. Although suffering from shock and a heavy blow on the chest, this airman immediately proceeded to extricate the rear gunner, who had sustained a broken arm and was trapped in his turret. After freeing the air gunner, Sgt. Roberts attempted to enter the fuselage to rescue other members of the crew, knowing full well that the petrol tanks might explode at any moment. There was also the risk of ammunition and pyrotechnics exploding. He was, however, compelled by the flames to abandon his efforts. He then found the flight engineer, who had been thrown clear, and did what he could for him until the airman died. Sgt. Roberts, in his disregard of the risk of sustaining further injuries, showed great courage and devotion to duty in his attempt to rescue his companions.

LETHAL DARTS: Rocket projectiles piled high on their trollies ready for despatch by Hawker Typhoon. Some rocket-firing Typhoons are now fitted with four-bladed airscrews.

Sgt. T. V. SHAW, R.A.F., No. 103 Sqn.—One morning in February, 1944, Sgt. Shaw was the flight engineer of an aircraft which, when approaching to land after an operational sortie, crashed and immediately caught fire. Three members of the crew of the Lancaster managed to extricate themselves. Sgt. Shaw, who was suffering from shock and was badly shaken, was escaping through his window when he noticed that, although the propellers were broken off, the engines were still running. Disregarding his personal safety, Sgt. Shaw made his way back into the burning bomber and succeeded in switching off the engines, thereby making any rescue work less dangerous. With the assistance of a medical officer, Sgt. Shaw then succeeded in extricating the bomb aimer, who had been trapped in the fuselage. Another member of the crew (the mid-upper gunner), who was burned on the face and hands and blinded by blood, was making his way to the end of the aircraft which was burning. Sgt. Shaw re-entered the aircraft and, despite the intense heat, smoke and fumes, he succeeded in getting the mid-upper gunner to safety. Sgt. Shaw's unselfish and courageous actions undoubtedly contributed to a greater saving of life than would otherwise have been effected.

Cpl. J. D. SIMMONS, R.A.F.V.R.—In July, 1943, a Whitley aircraft crashed into a Hampden in which an airman was working. Cpl. Simmons immediately went to the rescue of the trapped airman, whose clothing was on fire, and, removing his own tunic, he smothered his colleague's burning clothing. He then raced to another aircraft some twenty yards away and removed it to safety just before the depth charges exploded in the Whitley and Hampden aircraft. On December 21st, 1943, regardless of personal danger, Cpl. Simmons climbed into the cockpit of a Dakota aircraft which had crashed and had lost a propeller. The crew had left the Dakota, but one of the engines was still running and smoke was pouring from it. Cpl. Simmons switched off the engine, turned off all petrol cocks, and so prevented a fire from breaking out. His prompt and courageous actions have thus saved an airman's life and prevented the probable destruction of two aircraft.

Cpl. F. W. STYLES, R.A.F.V.R.—One night in November, 1943, a Catalina aircraft crashed when alighting on the water, and immediately submerged with the exception of its tail. Cpl. Styles was duty coxswain of the control boat on the flare path, and he at once proceeded to the scene. Diving overboard, he brought to safety two men who were afloat. Learning that six members of the crew were still in the aircraft, Cpl. Styles opened the blisters and swam around inside the aircraft in an attempt to locate them. He was unable from the inside to penetrate to the front of the Catalina. After ascertaining that nobody was left in the tail, he swam round to the front and repeatedly dived in an attempt to enter the Catalina from its nose. After twenty minutes Cpl. Styles was forced to abandon his attempts owing to the icy cold water. Returning to his launch, he took the aircraft in tow, but the line parted and the Catalina ultimately sank. Cpl. Styles displayed bravery in circumstances of great difficulty. On a previous occasion, in September, 1943, when on duty, this airman dived into the sea and rescued a ten year old boy who had fallen into the water and had disappeared below the surface.

L.A/C. E. H. TARRY, R.A.F.V.R.—In January, 1944, during an enemy air attack two bombs were dropped on a small explosives storage unit, and one of the missiles hit a storehouse containing explosives. The senior N.C.O. was injured and dazed by falling debris. L.A/C. Tarry, taking charge of subsequent proceedings, was instrumental in applying all available fire fighting appliances and, later, in guiding the N.F.S. crew to the most advantageous positions from which to deal with the fire. Although fully aware of the dangerous nature of the contents of the store house, L.A/C. Tarry, on more than one occasion, entered the building in order to direct operations more efficiently. Many of the weapons in the storehouse were split open and became ignited. L.A/C. Tarry's great powers of leadership, courage and initiative contributed materially to the saving of much of the valuable stores. He set an excellent example throughout.

L.A/C. S. J. A. C. WEBB, R.A.F.V.R.—One night in February, 1944, a Wellington aircraft, on returning from a cross country training flight, crashed in a thick spinney in the vicinity of an airfield. The crash tender, with L.A/C. Webb as the leader of the crew, quickly arrived on the scene. The aircraft was burning from end to end. L.A/C. Webb, having got the tender into operation, heard the rear gunner, who was trapped in his turret, calling for help. Ignoring the danger from exploding ammunition, L.A/C. Webb stood in front of the guns, kicked in the panels between them, and then smashed the perspex in an endeavour to extricate the airman, who was trapped by his feet. Owing to the broken brushwood around L.A/C. Webb it was impossible for anyone to approach near enough to render assistance. The air gunner went limp, but L.A/C. Webb, by calling to him, encouraged him to rally himself sufficiently to release his feet. Both airmen eventually managed to roll clear. L.A/C. Webb's disregard of danger and his courage and devotion to duty undoubtedly saved the gunner's life.

A/C.1 H. E. ANDERSON, R.A.F.V.R.—In 1944 A/C.1 Anderson was a member of the crew of a High Speed Launch which was attacked from the air and set on fire; with the exception of A/C.1 Anderson all the motor boat's crew were injured by gunfire. A/C.1 Anderson launched the Carley float unaided, dragged the first coxswain to the side, and then succeeded in lifting him into it. By this time the launch was burning furiously from stem to stern and ammunition was exploding; there was also the grave danger of the fuel tanks exploding. Nevertheless, A/C.1 Anderson went into the wireless cabin, wheelhouse and bridge to ascertain if anyone remained who was alive. One member of the crew, who was in the wheelhouse, had sustained a shattered arm and leg, and, although conscious, was unable

SERVICE AVIATION

to move. A/C.1 Anderson was responsible for saving this airman's life. It was not until he had ensured that no further members of the crew were alive that A/C.1 Anderson got into the Carley float. Then, showing presence of mind, he pulled away from the launch to avoid the spread of burning petrol. Throughout, this airman displayed great courage and devotion to duty

Roll of Honour

Casualty Communiqué No. 397.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 98 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. N. Hindley; Act. Sqn Ldr. A. V. Maslen, D.F.C.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. H. Curry; Sgt. H. Gossop; Sgt. D. T. Hand; P/O. S. W. Hatwell; Flt. Sgt. J. B. Horsburgh; Flt. Sgt. J. R. McIntosh; Flt. Sgt. A. J. Oakes; F/O. G. E. M. Parker; Sgt. H. W. Raggett; Sgt. J. Scott; Act. Sqn. Ldr. P. R. Vincent; P/O. N. P. Wardman; P/O. A. H. W. Warrell; Act. Sqn. Ldr. B. E. G. White.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. F. Andrews; Sgt. I. G. Armet; Sqn. Ldr. The Hon. R. A. G. Baird; Sgt. F. Ball; F/O. R. G. Ballantine; Sgt. L. G. Bentley; Sgt. A. S. Biffin; P/O. L. D. Blomley; Flt. Sgt. E. W. Bower; Sgt. A. P. Bowker; Sgt. L. J. D. Bristow; Sgt. L. Brown; F/Sgt. T. C. Cassidy; Sgt. E. A. Charles; Sgt. L. Cocking; Sgt. J. Collins; Act. Flt. Lt. E. R. F. Cooke; Sgt. A. Corns; Sgt. B. G. Crisp; P/O. J. A. H. Dale; Sgt. D. W. Downes; Sgt. J. W. Doyle; Sgt. D. W. Ellis; Sgt. J. J. Evans; Sgt. P. O. Fletcher; Act. W/O. R. Gafford; Sgt. D. Glassman; Sgt. J. G. Golden; Sgt. E. Green; Sgt. L. T. Halson; F/O. R. T. Hamer; Sqn. Ldr. R. Hawkins, M.C., A.F.C.; P/O. C. Hayley; Flt. Sgt. P. Holmes; F/O. B. J. Hull, D.F.M.; Sgt. V. R. Jacob; F/O. D. G. Jones; Sgt. E. B. Jordan; Sgt. D. P. Kelly; Sgt. H. King; F/O. E. T. D. Lees; Sgt. G. D. Loveridge; Flt. Sgt. J. Lynch; Sgt. W. S. Maben; Sgt. A. C. MacLeod; Sgt. L. E. Maidment; F/O. W. J. Moorcroft; Sgt. H. Nelson; Sgt. R. Newcombe; Flt. Sgt. W. R. Pallister; Flt. Lt. H. C. Pexton; Sgt. R. F. Rashley; F/O. P. Renton; Sgt. F. Robertson; Sgt. E. Smith; Sgt. S. Spedding; Sgt. J. Sullivan; Sgt. A. Sunley; Sgt. J. P. Taylor; F/O. H. L. Temple; Flt. Sgt. R. A. Walker; Sgt. W. D. R. Walters; Sgt. F. H. Webb; Sgt. F. S. Williams; Sgt. J. R. S. Williams; Sgt. E. F. J. Willis; Sgt. A. Worsdale; Sgt. T. S. Yarwood.

WOUNDED OR INJURED IN ACTION.—Sgt. F. Devonshire; Sgt. W. J. Knight; Sgt. G. Thomas.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. P. A. Hatfield.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. P. C. K. Bennett; Sgt. F. S. Bodkin; Sgt. L. H. Broad; Sgt. E. T. W. Byford; Sgt. R. M. Byrne; Sgt. D. T. Cash; F/O. W. A. L. Colhoun; Sgt. K. Ellam; Flt. Sgt. J. Knights; F/O. J. R. Laing; Flt. Sgt. W. T. G. Peckham; Flt. Sgt. R. Prinn; Sgt. T. Ratcliffe; F/O. F. C. Rousseau; Sgt. C. A. Salt; Flt. Sgt. G. E. Scott; Sgt. W. A. Simmons; Sgt. A. Vickers; Sgt. K. A. Ward; Sgt. H. C. Webb; Sgt. D. C. Youngs.

MISSING.—Sgt. R. G. Arthur; Sgt. W. G. Baker; Sgt. H. Ball; Flt. Sgt. H. K. Barden; Sgt. W. Barratt; Sgt. C. G. G. Bateman; Sgt. T. W. Bint; Sgt. W. Bowey; Sgt. D. F. Bowthorpe; Act. Flt. Lt. J. H. Bracewell; Sgt. D. F. Brooker; Sgt. J. W. Burke; Sgt. R. W. Chandler; Flt. C. C. Christie; Flt. Sgt. L. J. Collis; F/O. D. A. Colombo; Sgt. P. J. S. Crawford; Sgt. F. Curtis; Sgt. R. C. F. Davidson; Sgt. K. Davies; Flt. Sgt. J. Dear; Sgt. A. Diggle; Sgt. J. M. Ella; Sgt. R. J. Faulkner; Flt. Sgt. J. C. Garratt; Sgt. J. A. Green; Flt. Sgt. G. L. Grimes; Sgt. J. E. Hammond; P/O. R. A. Hanks; P/O. B. M. Hayes; Sgt. C. W. Hicks; Sgt. A. J. Hull; Sgt. H. Hull; F/O. A. B. Hunter; Flt. Sgt. H. Jackson; Sgt. R. G. Johns; Flt. Sgt. R. Johnson; F/O. R. Kearney; Sgt. D. Keeley; F/O. A. Lees; Sgt. J. A. Lincoln; Flt. Sgt. G. T. A. Lovell; Sgt. N. B. Lowlett; Sgt. G. W. C. Mabbott; F/O. G. Mamoutoff; Flt. Sgt. K. D. Mardon-Mowbray; Flt. Sgt. K. H. Margetts; Sgt. J. McGhie; Sgt. L. R. Morgan; Flt. Sgt. V. V. Mortlock; Flt. Sgt. C. Nathanson; Sgt. H. N. Norton; Sgt. J. R. Nutman; Sgt. H. D. Patchett; Sgt. W. G. Perrie; Sgt. G. T. Probert; Sgt. G. P. Rae; Act. Flt. Lt. R. Richmond; Sgt. T. K. Rigby; Wing Cdr. O. W. A. Ross; Sgt. E. Smith; Flt. Sgt. J. Smith; Flt. Sgt. V. W. Spencer; F/O. R. H. Stevens; P/O. T. E. Vipond; Sgt. W. K. Walker; Sgt. E. W. Wash; Sgt. R. C. Waters; Sgt. V. J. Watson; Sgt. H. Watt; Flt. Sgt. R. A. Webb; Sgt. R. H. J. Wellfare; Sgt. R. Whitelaw.

KILLED ON ACTIVE SERVICE.—Sgt. B. A. Bell; F/O. J. Birkett; Sgt. B. J. Brawn; Sgt. P. Burchell; Sgt. P. J. Endersby; Sgt. C. Farthing; P/O. R. H. Gardner; Sgt. J. Haslam; Sgt. W. H. Hickson; Sgt. J. G. Hinder; F/O. W. Lewis; Sgt. P. D. Newman; F/O. R. E. Ross; Flt. Lt. J. E. Sanderson; Sgt. H. W. Simpson; Sgt. H. Smith; P/O. W. R. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. R. Morgan; L.A/C. D. Sutherland

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. A. S. M. Good; Sgt. H. Hewson; Sgt. R. W. Tattle; Sgt. R. Terry.

DIED ON ACTIVE SERVICE.—Flt. Lt. E. G. Brettell; Sgt. V. J. Brown; F/O. L. G. Bull, D.F.C.; Sqn. Ldr. R. J. Bushell; F/O. N. J. Casey; F/O. D. H. Cochran; Sqn. Ldr. I. K. P. Cross, D.F.C.; Flt. Lt. B. H. Evans; Flt. Lt. W. J. Grisman; Flt. Lt. A. D. M. Gunn; Flt. Lt. C. P. Hall; L.A/C. G. Harris; Flt. Lt. A. R. H. Hayter; Cpl. B. A. McK. Humphreys; Flt. Lt. E. S. Humphreys; Sqn. Ldr. T. G. Kirby-Green; Flt. Lt. T. B. Leigh; Cpl. J. A. McLaren; Flt. Lt. H. J. Milford; W/O. J. C. Stanton; F/O. R. C. Stewart; Flt. Lt. J. G. Stower; Flt. Lt. D. O. Street; Flt. Lt. C. D. Swain; F/O. G. W. Walenn; Act. Sqn. Ldr. J. E. A. Williams; Flt. Lt. J. F. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. R. G. Boston; Flt. Sgt. A. C. East; Sgt. A. E. Gates; Sgt. N. Gent; Flt. Lt. D. R. Illingworth; Sgt. D. J. Leslie; Sgt. A. W. Sherry; F/O. P. Y. Stead, D.F.C.; Sgt. H. W. Thornton; Flt. Sgt. D. O. Vize.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/C/W.1 A. H. Reeve

Royal Australian Air Force

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. M. J. Herd.

MISSING, BELIEVED KILLED IN ACTION.—Act. Flt. Lt. D. F. Constable; P/O. E. A. J. Giles; P/O. G. A. Hampton.

MISSING.—Flt. Sgt. S. W. Jones; Act. Flt. Lt. F. J. King.

KILLED ON ACTIVE SERVICE.—Sgt. N. H. Block; Flt. Sgt. K. J. Caladine; Sgt. G. A. Goodenham; Flt. Sgt. R. A. Grosvenor; Flt. Sgt. E. L. Reay; Flt. Sgt. P. Sinclair; Flt. Sgt. R. C. Walker.

DIED ON ACTIVE SERVICE.—Act. Sqn. Ldr. J. Catanach, D.F.C.; Flt. Sgt. A. H. Hake; Flt. Lt. R. V. Kieran.

An R.A.F. bomber crew being interrogated by a W.A.A.F. officer after a night raid on Boulogne. Great damage was done to E-boats, R-boats and minesweepers in the harbour.

Royal Canadian Air Force

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. T. J. Adkison; F/O. R. F. Conroy; Sgt. E. J. Halbert; Sgt. W. G. Hampton; F/O. O. L. Jackson; Sgt. J. J. L. Jette; Sgt. L. J. Keely; Flt. Sgt. R. A. McBeath; F/O. G. I. MacKay; W/O. T. Schioler; Sgt. C. W. Strom; Flt. Sgt. W. G. Tillmann; F/O. J. H. Warkentin; W/O. A. E. Yaworski.

MISSING.—Flt. Lt. L. T. Berrigan; Flt. Sgt. J. E. Y. Bouchard; Flt. Sgt. M. W. Boyer; F/O. J. P. P. F. Brazeau; Sgt. P. D. Cleal; Sgt. R. L. Coulter; F/O. V. E. Cross; Flt. Sgt. N. S. Davidson; F/O. E. J. Deemer; P/O. S. G. Dewdell; Flt. Sgt. M. Fedoruk; P/O. J. Gibson; Sgt. J. J. B. B. Huot; P/O. N. H. Jones; F/O. W. E. Krampe; P/O. M. C. Latornell; P/O. J. A. Laviolette; P/O. L. M. McCann; Flt. Sgt. J. N. A. McDonagh; F/O. A. R. McGillivray; P/O. M. H. MacLeod; Flt. Sgt. R. W. McNeil; Flt. Sgt. R. J. Middlemas; W/O. K. A. Neville; Sgt. K. L. Radcliffe; F/O. L. A. L. Renaud; F/O. H. L. Shortliffe; P/O. J. C. Tracey; P/O. C. S. Turner; P/O. A. R. Van Slyke; P/O. S. A. Wick; W/O. A. J. Young.

KILLED ON ACTIVE SERVICE.—P/O. R. F. Calnan; F/O. C. R. Floyd; F/O. M. L. Fullerton; Sgt. J. H. Gilbertson; F/O. D. L. Jacobs; Sgt. L. H. Johnston; P/O. R. N. MacGillivray; P/O. H. C. Millen; F/O. W. J. Mohring; Flt. Lt. C. G. Pennock.

DIED ON ACTIVE SERVICE.—Flt. Lt. H. Birkland; Flt. Lt. G. A. Kidder; Flt. Lt. P. W. Langford; Flt. Lt. G. E. McGill; Flt. Lt. J. C. Wernham; Flt. Lt. G. W. Wiley.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. H. H. W. Anderson.

MISSING.—Act. Flt. Lt. D. P. Bain; Flt. Sgt. J. L. Duffy; Flt. Sgt. C. G. Foster; Flt. Sgt. D. N. Luxton; F/O. J. M. Mee.

KILLED ON ACTIVE SERVICE.—Flt. Lt. V. Allport, D.F.C.

DIED ON ACTIVE SERVICE.—Flt. Lt. A. G. Christensen; F/O. P. P. J. Pohe.

South African Air Force

DIED ON ACTIVE SERVICE.—Lt. J. S. Gouws; 2/Lt. F. C. A. N. McGarr; Lt. R. J. Stevens.

Official Correction

Casualty Communiqué No. 396.

Under "MISSING" delete Sgt. M. S. Alkemade.

Air Transport Auxiliary

First Officer HENRY JOHN NORMAN ROWE, A.T.A., died following an aircraft accident whilst ferrying His Majesty's aircraft in England.